FIELD CROP ABSTRACTS

Vol. 13 May, 1960 No. 2

REVIEW ARTICLE

# RESEARCH ON OIL-SEED FLAX IN NORTH AMERICA

BY

W. G. McGREGOR

(Oilseeds Research, Genetics and Plant Breeding Research Institute, Canada Department of Agriculture, Ottawa, Ontario)

## Introduction

The history of flax in North America dates back over 300 years. It is generally believed that Hebert, the first farmer in Canada, sowed flax on the site of the present courthouse in Quebec City in 1617. The kind of flax grown by these early settlers is not known but it is believed to have been a short-fibre type. As early as 1640 a bounty was offered by the Assembly of Massachusetts to encourage flax production, but it was nearly a century later before the crop was grown in commercial quantity.

The invention of the cotton gin in 1792 and the consequent cheapening of cotton cloth checked the cultivation of flax for fibre. The manufacture of linseed oil began in the USA in 1805 and seed production was encouraged. From 1850 to 1900 this industry developed rapidly. In Canada, flax production was stimulated by the establishment of an oil crushing plant at Baden, Ontario, in 1864 by J. and J. Livingston. Flax moved west with the frontier until by 1900 the centre of production in the USA had shifted to North Dakota. It was first introduced into Western Canada about 1875 and by 1912 production reached 26 million bushels. Flax was well suited to the great plains area and to-day about 9 million acres are sown annually within an area extending from the States of Iowa and Minnesota, north through the Dakotas and Montana and on through the Prairie Provinces of Canada to the Peace River Area in Alberta.

## Disease problems in flax

### FLAX WILT

Flax production reached the present principal producing areas without the benefit of research. The shift to new areas was due to excellent crops from newly broken land and to the devastating effect of wilt on land repeatedly cropped to flax. About 1900, H. L. Bolley of North Dakota discovered that this failure of flax on old land was caused by *Fusarium lini*. The story of how Bolley isolated the organism and later developed resistant varieties from heterogeneous populations is reviewed by Dillman (7). Later studies relating to the variations found under different environmental conditions and to the presence of biotypes or races within the organism have been summarized by Christensen (4). Wilt nurseries using inoculum from different areas are used to help in incorporating additional genes for resistance into desirable agronomic flax varieties.

### RUST

Flax rust (*Melampsora lini*) was first reported in the USA in 1901. Little damage was caused until the more humid weather following the drought of the thirties and, with an increased acreage during World War II, rust epidemics became prevalent. Flor (11) was the first to demonstrate physiologic specialization in flax rust. He identified 25 rust-conditioning genes in 5 loci on 4 chromosomes. This limits to five the number of rust-resistant genes that can be incorporated into the flax plant. No variety is known that is resistant to all races but no race is virulent on all varieties. Flor explains the host-parasite interaction in flax as a gene-for-gene relationship. For each gene conditioning susceptibility or resistance in the host there is a corresponding gene for virulence in the pathogen. Lines possessing single rust-conditioning genes were developed and later isogenic lines of Bison carrying single genes for rust reactions were produced. These should be of great value in studying the nature of resistance. Flor (12) was the first to report induced mutations for pathogenicity in the rust fungus following irradiation of uredospores with ultra-violet light. The number of mutations obtained (13), suggests that mutation to virulence in rusts may be more frequent than expected and may explain the sudden appearance of a new virulent race. However, flax breeders have been quite successful in coping with the rust menace, and, in the past 20 years, 12 resistant varieties have been introduced. At present practically all the commercial varieties are rust resistant and at least 12 genes are available that condition resistance to all North American races.

### PASMO

Pasmo (*Sphaerella linorum*), first described in Argentina in 1911, was found in North Dakota in 1916. It was reported at Ottawa in 1939 and in Mantitoba in 1940. Heavy infections cause premature ripening and reduce seed yield and weight of the seed (28). The reduction is greatest when plants are inoculated at the flowering stage.

Sackston and Carson (29) found that inoculation at this stage also gave the greatest reduction in oil content and iodine number. No satisfactory parental source of resistance is known. Several varieties are less susceptible than average and these are being used in plant-breeding programmes to increase resistance in agronomically desirable varieties. Irradiation as a means of inducing mutations is being investigated in the search for resistant genes.

ASTER YELLOWS

This disease is caused by a virus and has been found on flax in the Midwest for the past 25 years. Since 1952 it has gradually increased until in 1957 it was the most widespread and destructive disease of flax throughout the area. Its prevalence has been associated with the relative abundance of the insect vector, the six-spotted leafhopper, *Macrosteles facifrons*. According to Chiykowski (3), working with R. K. Chapman of Wisconsin, the leafhoppers originate in winter grain fields in north-western Texas and southern Oklahoma and migrate northward with southerly winds in the spring. The distribution of aster yellows is therefore very similar to the distribution of wheat stem rust. Projects have been organized at St. Paul, Minn., and Winnipeg, Man., to enlist the services of pathologists, entomologists and plant breeders to acquire more detailed knowledge of this disease.

Although wilt, rust and pasmo are the most important diseases of flax in North America, others such as stem break, *Polyspora lini*, anthracnose, *Colletotrichum lini*, Rhizoctonia, other seedling blights and root rots have often been destructive. Losses have been reduced by the use of suitable seed disinfectants.

The effect of seed damage on germination, stand and yield has been emphasized in recent studies reviewed by Kommedahl *et al.* (18). Damage occurs from mechanical injury, natural splitting of the seed coat or weathering. All commercial seed contains a percentage of damaged seeds although frequently these can only be detected under magnification. Such seed is seldom free of fungi, but damage from fungi can be prevented by suitable fungicides. Dr. J. E. Machacek at the Laboratory of Plant Pathology, Winnipeg, Man., has carried out co-operative experiments with newly introduced fungicides on flax since 1944 under the auspices of the American Phytopathological Society. Machacek and Greaney (20) found that treatment of damaged seed increased germination and occasionally increased yield.

## Cytological studies

The genus Linum contains about 200 species. Ray (27) studied cytologically 30 species and 28 commercial varieties. Haploid numbers of 8, 9, 10, 14 and 15 were present in the genus. On the basis of chromosome size plus chromosome number, 7 different karyotypes were recognized. Most of the species have a haploid number of 9. All varieties of common flax have a haploid chromosome number of 15.

## Linseed quality

Linseed flax is grown primarily for its oil and a high degree of unsaturation is preferred by the trade. Although oil content is genetically controlled it is influenced by environment. Dillman and Hopper (8) considered July the critical month for oil formation in flax. Deficient precipitation and high temperatures, which frequently occur in July, caused a decrease in seed size, oil content and iodine number. Painter *et al.* (25) on the other hand concluded that the length of time the flax crop is exposed to high temperatures in July affects the iodine number of the oil. Lehberg, McGregor and Geddes (19) followed oil formation at 3-day intervals from flowering to maturity and found the rate of oil deposition was in some cases extremely rapid, 80 – 90% of the maximum oil found being deposited by the 15th to the 18th day. Unsaturation proceeds more slowly than oil deposition. Johnson (16) and McGregor (23) reported a positive correlation between oil content and large seed. Myers, Moseman and Chu found at least 3 factors responsible for seed size and Carnahan found oil percentage to be inherited on a multiple-factor basis. These studies were made in Minnesota and were reviewed by Culbertson (6). McGregor (23) found iodine number to be governed in inheritance by multiple factors with an association of high iodine number with a factor for yellow seed colour, while Carnahan reported that yellow-seeded segregates have a significantly higher oil content than brown-seeded segregates.

Linolenic and linoleic acids are the most active constituents in drying oils. According to Sallans (30), who studied 3 varieties grown in Saskatchewan, iodine number of the oil provides a reliable index of the fatty-acid composition. Klostermann (17) with more extensive data also observed a high correlation between iodine number and linolenic acid content. A study (unpublished) of standard varieties grown at two widely separated locations in Canada, one in southern Manitoba and the other in northern Alberta showed that environmental differences had a significant effect on linolenic-acid content. Varieties always held their respective rank regardless of environment but higher linolenic acid was produced in the cooler climate of northern Alberta.

Nesbitt and co-workers (24) at the North Dakota Experiment Station collected samples at regular intervals during the maturation of the seed. As the flaxseed developed, the percentage of linolenic acid increased and oleic acid decreased while linoleic acid showed no significant change.

They believe their data suggest a desaturation process as the mechanism of oil formation with a stepwise dehydrogenation from saturated acids to oleic, linoleic and linolenic acid. In similar studies at Ottawa (unpublished) with the varieties Raja and Rocket, percentages of oleic acid dropped while linolenic increased during maturation. However, since the actual weight of all acids increased appreciably as the seed matured it was impossible to indicate a transfer from one acid to another.

Paints, varnishes and floor coverings are the major outlet for linseed oil. Research in this field has developed to the point where many oils are interchangeable. During the past three decades synthetic products based largely on petroleum have been replacing linseed and other oils in this market. The use of drying oils per gallon of paint, varnish and lacquer used in the USA dropped from 2·4 lb. in 1931–4 to 1·1 lb. in 1957. It is only because of the large increase in the amount of paint used that the volume of linseed oil consumed has been maintained.

Industry continues to become more specialized and its requirements are becoming more critical. Flax is one of the few sources of linolenic acid. Although linseed oil contains at least 50% linolenic acid, agronomic research should be able to raise this higher and thus exploit this characteristic peculiar to linseed oil. Meantime, continued study is needed to overcome such defects of linolenic acid as ' after-yellowing ' in paint finishes, and to find new uses for this acid. Basic research in oil quality offers the greatest promise of expanding linseed oil consumption and thereby maintaining a place for flax in the future.

## Physiological studies

Differences in the growth rates of flax varieties have been observed by several investigators. Hansen and McGregor (15) studied the degree with which these are associated with agronomic characters and environmental conditions. Varieties differed significantly in relative rate of stem elongation. A reduction was associated with delayed blossoming. High temperature and sunshine appeared to favour an increase in relative growth rate (dry weight) but a decrease in the rate of elongation. Plessers (26), using a growth cabinet, found that the Raja and Redwing varieties differed significantly in the response of onset of flowering and stem elongation to certain temperatures and red radiation. Red radiation advances the onset of flowering in Raja more than in Redwing. The rate of growth was accelerated by red radiation but the acceleration was greater for Raja than for Redwing and also greater for Raja at 70°F. than at 80°F. Further studies (unpublished) have indicated that in these varieties the response to red radiation is controlled by a different gene in each variety. The combination of these two genes produces an additive effect. The response to temperature is controlled by several genes.

## Flax culture

The history of flax in the USA and Canada has been characterized by rather wide and often very sudden fluctuations in production. Stabilization of production would be beneficial to the processors and to the producer and could be a suitable subject for study, particularly in Canada.

### ROTATION

Flax is included in many different rotations. Projects have been organized in recent years to test a number of crop sequences containing flax but it will be some time before information is available.

### WEEDS

The flax plant is a poor competitor with weeds which reduce yields and interfere in the utilization of the straw. Burrows and Olson (2) have shown that wild mustard (*Brassica arvensis*) at a density of 10 or more plants per square yard significantly reduces basal branching and hence yield. At even this low infestation rate the removal of weeds is justified.

Tillage practices can do much to improve the conditions for a good crop of flax. Weeds may be controlled in the crop preceding flax. Dunham (9) reported studies in Minnesota which demonstrated that a proper sequence of crops plus effective cultivation can reduce the weed population so that a succeeding flax crop will be relatively free from annual weeds. The weed population was reduced 40% by hoed corn, 20% by oat stubble ploughed in August and 25% by oat stubble disked in August. Early maturing varieties are available which allow sowing in the spring to be delayed to permit tillage for control of wild oats and other weeds.

Flax production has been improved in recent years by the use of several chemical herbicides. Dunham (9) has reviewed the research on many of these now used successfully including 2-4,D (amine salts and esters), MCPA (amine salt) and TCA (sodium salt). Burnside (1) reported the advantages of dalapon as an alternative to TCA. Flax is one of the few crops tolerant to herbicides that kill both grass weeds and broad-leaved species. However, as pointed out by Burnside, a number of weeds cannot be selectively killed in flax without increasing the rate of application to the point where flax is injured. Shebeski and Friesen (31) discuss recent research with several of the newer herbicides in Manitoba.

Susceptibility of the crop to herbicides may be as important as susceptibility of the weeds. Abnormalities such as fused leaves, fused bolls and fasciated stems occur frequently in treated flax crops. Maturity may be delayed by chemicals which induce injury. However, the amount of

injury depends, at least in part, upon the nature and formulation of the herbicide, time of application and the flax variety (9). Friesen (14) found that MCPA caused the least injury. Bothun, according to Dunham (9), reported that varietal response to herbicides is genetically controlled. Therefore it should be possible to produce herbicide-tolerant varieties. Nevertheless, even with existing varieties the reduction in yields caused by the judicious use of chemicals is much less than that which would result if weeds were allowed to grow to maturity.

FERTILIZERS

Flax responds well to high residual soil fertility but often gives a poor response to direct fertilizer applications. There have been frequent instances in which the stand of flax has suffered from the use of fertilizers. MacIsaac and McGregor (21) reported increased yields from an application of 20 lb. ammonium phosphate in northern Saskatchewan and Alberta. No effect was noted on seed quality. McGregor (22) found the main response in several areas to be due to addition of nitrogen. He pointed out that with the improved herbicides to control weeds it is now practical to increase the nitrogen applied. Although the belief has been maintained by many farmers that flax depletes the soil of plant food, it has been established by Clagget *et al.* (5) that in a comparison of average crops in Minnesota and North Dakota in any crop year, flax will remove less N, P, K and S than wheat, oats or barley.

## Regional organization for research

Investigations with flax were undertaken by the Experimental Farms Branch of the Canada Department of Agriculture at the time of its organization in 1888. As experimental stations and provincial universities were set up in the Prairie Provinces work with flax was extended. Uniform variety trials were begun in 1935 and later were expanded to cover all stations in the three Prairie Provinces. These tests provide extensive data on maturity, disease resistance, quality and yield. Annual meetings in February under the auspices of the National Research Council of Canada, Associate Committees on Plant Breeding and Grain Research, provide an opportunity for co-operators to meet together and discuss the data. From these discussions recommendations are made regarding the disposal of new varieties and the best are ultimately licensed for distribution.

The flax research programme in the USA is also largely co-operative. Federal employees working on flax are located at State experiment stations and work on both local and regional problems. A sound basis for the co-ordination of these investigations was developed through the organization of the Flax Institute of the United States in 1936 by R. L. Walster and others. Three years later uniform regional nursery trials were started and no new variety of flax has been released without it having been tested in this co-operative nursery. Promising new selections of flax from both USA and Canada are compared. These co-operative tests allow breeders to evaluate their new varieties quickly over a wide area. One of the most notable features in this organization for research is the excellent co-operative approach among the research workers on an international level. Meetings of this Institute held annually in November make it possible for workers in the USA and Canada to come together to discuss flax problems.

## Bibliography


1. Burnside, O. C. 1958. Recent studies on the use of herbicides in flax. *Proc. 28th Annu. Conf. Flax Inst. United States*, 24–5.
2. Burrows, V. D. and Olson, P. J. 1955. Reactions of small grains to various densities of wild mustard and the results obtained after their removal with 2,4-D or by hand. 2. Experiments with flax. *Canad. J. agric. Sci.* **35**, 193–201.
3. Chiykowski, L. N. 1958. Studies on migration and control of the six-spotted leafhopper, *Macrosteles facifrons* (Stol.), in relation to transmission of aster-yellow virus. *Thesis for Ph.D. Wisconsin, U.S.A.*
4. Christensen, J. J. 1954. The present status of flax diseases other than rust. [Cont. in] Advances in Agronomy 6. 161–8, New York : Acad. Press Inc.
5. Claggett, C. O., Stoa, T. E., Klosterman, H. J., Kingsley, A. F. and Gisler, W. W. 1952. The soil depleting power of the flax crop compared with that of hard red spring wheat, oats and barley. *Bull. 378 N. Dak. agric. Exp. Sta.*, pp. 26.
6. Culbertson, J. O. 1954. Breeding. [Cont. in] Advances in Agronomy 6. 174–8, New York : Acad. Press Inc.
7. Dillman, A. C. 1936. Improvement in flax. [Cont. in] Yearbook of Agriculture for 1936 U.S. Dep. Agric., 745–84.
8. ———— and Hopper, T. H. 1943. Effect of climate on the yield and oil content of flaxseed and on the iodine number of linseed oil. *Tech. Bull.* 844 U.S. Dep. Agric., pp. 69.
9. Dunham, R. S. 1954. Weeds. [Cont. in] Advances in Agronomy 6. 168–74, New York : Acad. Press Inc.
10. Flor, H. H. 1954. Flax rust. [Cont. in] Advances in Agronomy 6. 152–61. New York : Acad. Press Inc.
11. ———— 1956a. The complementary genic systems in flax and flax rust. [Cont. in] Advances in Genetics 8. 29–54. New York : Acad. Press Inc.
12. ———— 1956b. Mutations in flax rust induced by ultra-violet radiation. *Science* **124**, 888–9.
13. ———— 1958. Mutations to wider virulence in *Melampsora lini*. *Phytopathology* **48**, 297–301.
14. Friesen, H. A. 1956. MCP vs 2,4-D for the control of weeds in grain crops. *Proc. 9th Conf. Western Section Nat. Weed Comm. Sask.*, 10–13.
15. Hansen, D. R. and McGregor, W. G. 1954. Comparative growth studies of flax varieties. *Canad. J. agric. Sci.* **34**, 565–72.

16. Johnson, I. J. 1932. The relation of agronomic practice to the quantity and quality of oil in flaxseed. *J. Amer. Soc. Agron.* **24**, 537–44.

17. Klosterman, H. J. 1958. Comparative fatty acid distribution in standard varieties of flax with the World Collection. *Proc. 28th Annu. Conf. Flax Inst. United States*, 11–12.

18. Kommedahl, T., Christensen, J. J., Culbertson, J. O. and Moore, M. B. 1955. The prevalence and importance of damaged seed in flax. *Tech. Bull. 215 Minnesota agric. Exp. Sta.* pp. 40.

19. Lehberg, F. H., McGregor, W. G. and Geddes, W. F. 1939. Flax studies 4. The physical and chemical characteristics of flaxseed at progressive stages of maturity. *Canad. J. Res. C.* **17**, 181–94.

20. Machacek, J. E. and Greaney, F. J. 1948. Summary of co-operative experiments on treatment of flaxseed. *Phytopathology* **38**, 803–7.

21. MacIsaac, F. M. and McGregor, W. G. 1941. The effect of ammonium phosphate on the yield and quality of linseed flax in northern Saskatchewan and north eastern Alberta. *Sci. Agric.* **22**, 195–200.

22. McGregor, J. M. 1956. Is flax hard on the land ? *Proc. Canad. Barley and Oilseeds Conf. Winnipeg, Man.*, 22–6.

23. McGregor, W. G. 1937. Inheritance of quantity and quality of oil in flax in relation to other plant characters. *Canad. J. Res. C.* **15**, 362–379.

24. Nesbitt, L. L., Pinckney, A. J., Stoa, T. E. and Painter, E. G. 1943. Oil formation in flaxseed. *Tech. Bull. 323 N. Dak. Agric. Sta.*, pp. 19.

25. Painter, E. G., Nesbitt, L. L. and Stoa, T. E. 1944. The influence of several conditions on oil formation and changes in iodine number during growth of flaxseed. *J. Amer. Soc. Agron.* **36**, 204–13.

26. Plessers, A. G. 1958. The response of two varieties of flax to light and temperature in growth cabinets. *Proc. 28th Annu. Conf. Flax Inst. United States*, pp. 13.

27. Ray, C., Jr. 1944. Cytological studies on the flax genus Linum. *Amer. J. Bot.* **31**, 241–9.

28. Sackston, W. E. 1950. Effect of pasmo disease on seed yield and thousand kernel weight of flax. *Canad. J. Res. C.* **28**, 493–512.

29. ———— and Carson, R. B. 1951. Effect of pasmo disease of flax on the yield and quality of linseed oil. *Canad. J. Bot.* **29**, 339–51.

30. Sallans, H. R. 1944. Canadian linseed 3. Iodine values in relation to oil and meal properties of commercial samples. *Canad. J. Res. F.* **22**, 146–56.

31. Shebeski, L. H. and Friesen, G. 1959. Recent developments in chemical weed control. *Agric. Inst. Rev.* **14**, 26–30.

(*Received* 2 *November*, 1959)

# FIELD CROPS

## CEREALS

### WHEAT

*See also Abs. 602, 609, 698, 702, 704, 892, 911, 924, 1042.*

532 Department of Agriculture, Western Australia. **Soils. Tillage experiments.** *Rep. Dep. Agric. W. Aust.* 1958, 27–8 [Received Dec., 1959]

In trials comparing wheat yields following initial land preparation with a mouldboard plough and a scarifier, the ploughed plots yielded nearly twice as much as the scarified ones at 2 stations and nearly 5 times as much at a third. Further cultivation with the scarifier was beneficial on the scarified plots only, but still did not bring the yields to within 75% of those of the ploughed plots. Weed control was the major factor determining the effectiveness of the cultivation treatments.—A.M.H.

533 Erroux, J. Note sur les blés des Oasis du Sahara Algérien. [**Note on the wheats in the Oases of the Algerian Sahara.**] *Bull. Soc. Hist. natur. Afr. N.* 1958, **49**, 180–95, bibl. 22, illus. [Received July, 1959]

This article is a further contribution to the study of the wheats of the Saharan Oases and the Fezzan [see *Fld Crop Abstr.* 6 : 1218, 1219, 8 : 374 and 9 : 339].—E.B.O.

534 García, P. E. Ensayos comparativos de rendimiento de trigos de origen híbrido (1956–57). [**Comparative yield trials with hybrid wheats (1956-57).**] *An. Inst. nac. Invest. agron.* 1959, **8**, No. 1, 9–53. [Cent. Cerealicult., Madrid]

The cultivation of the wheat varieties Aradi, Canaleja, Canti, Saria and Floreal is spreading in many regions of Spain, where these hybrids are also tested in comparative trials with a view to introducing them into new areas. Canti yielded well in Cuenca where it was not affected by late frosts. Hybrid 447 yielded best in Albacete and Zamora. [See also *Fld Crop Abstr.* 12 : 553.] F. concl.—E.B.O.

535 Erroux, J. Introduction au Catalogue des blés durs cultivés en Algérie. [**Introduction to the Catalogue of durum wheats grown in Algeria.**] *Bull. Soc. Hist. nat. Afr. N.* 1958, **49**, 124–42, bibl. 16, illus. [Received July, 1959]

Descriptions and cultural characteristics are given of the following recommended varieties of durum wheat : Hebda 3, Biskri AC$^2$, Oued Zenati 368, Bidi 17, Zenati × Bouteille 13·953, Saba, Langlois 1527 and Mohamed Ben Bachir 8.037.—E.B.O.

536 Institut National pour l'Étude Agronomique du Congo Belge. [**Wheat.**] *Rep. INÉAC, 1958*, 1959, 439.

In trials at Ndihira, Northern Kivu, the wheat varieties Bagé and 10180–54–29 were best and yielded 2742 and 2498 kg grain/ha, respectively.—E.B.O.

537 van der Merwe, J. J. **Wheat varieties for the Northern Transvaal irrigation areas.** *Fmg in S. Africa* 1959, **35**, No. 8, 10–12, illus.

During winter 1958, 22 varieties of wheat were tested in 3 irrigation areas in N. Transvaal to determine the most suitable varieties for these areas. Data on baking quality, length of the growing period, tillering capacity, thickness of straw, susceptibility to streak, and grain yields of the varieties tested are given. Varietal recommendations are made.—S.M.J.

538 Walkden Brown, C. and Fitzsimmons. R. W. **Growing durum wheat in New South Wales.** *Agric. Gaz. N.S.W.* 1959, **70**, No. 10, 547-51, illus.

The results of quality tests on N.S.W. durum wheats, of which Dural was the best, are summarized. The prospects for the production and marketing of this type of wheat in N.S.W. are discussed.—A.M.H.

539 Matheson, E. M. **Dural, an Australian macaroni wheat.** *Agric. Gaz. N.S.W.* 1959, **70**, No. 10, 544–6, illus.

The characteristics of Dural, the first durum wheat bred in Australia, are described. Its yield is slightly inferior to that of the best bread wheats, but yields of up to 14 bags/ac. [? 1 bag = 200 lb.] have been obtained in north-western N.S.W. Sowing in late April or early May at 40–45 lb./ac. is recommended.—A.M.H.

540 Serrano, V. C. and París, N. R. Las variedades mejoradas de trigo en el departamento de Nariño. [**The improved wheat varieties in the department of Nariño (Colombia).**] *Agric. trop., Bogotá* 1959, **15**, No. 5, 303–6, illus.

In 1958 the improved wheat var. Bonza yielded 1720 kg/ha (average of 46 fields) and Menkemen 1241 kg/ha (average of 10 fields) ; these yields were 120 and 60% higher, respectively, than the average wheat yield in the department

before the introduction of improved varieties.—E.B.O.

541 MALATO-BELIZ, J. A fitossociologia e as zonas económicas da cultura do trigo. [**Phytosociology and the economic zones of wheat cultivation.**] 1958, pp. 36, bibl. 19. [Esta. Melhor. Plantas, Elvas, Portugal] [Received July, 1959]

This article is concerned with a probable relationship between the yield of wheat and the composition of its weed flora. Weed species are named.—E.B.O.

542 PURDY, L. H. **Color distribution as an indicator of coverage in commercially treated wheat seed.** *Pl. Dis. Reptr* 1958, **42**, No. 10, 1129-32, bibl. 6, illus. [Washington Agric. Exp. Sta., Pullman]

Commercial treatment of wheat seed against soil-borne bunt (*Tilletia caries*) using BHC failed to give the degree of protection obtained in experiments. Samples treated with BHC (80% a.i.) or mercury fungicides were therefore taken from commercial seed-treating plants in Washington and Oregon. One of the BHC formulations that had been used contained a water-soluble red dye that clearly marked the treated seed. It was found that fungicide treatments at rates of less than 1 oz./bu. seed were insufficient to give good coverage, and that 25·9% of the seed in such lots was untreated. Laboratory tests confirmed that 1 oz./bu. was necessary for consistent protection and that 30% of commercially treated seed was unprotected. It was concluded that the apparent failure of BHC in commercial usage was due to faulty treatment and that the slurry method of applying BHC was not suitable for wheat.—J.D.J.

543 PURDY, L. H. **Results of regional seed-treatment tests for the control of seed-borne and soil-borne common bunt of winter wheat in the Pacific Northwest, 1958.** *Pl. Dis. Reptr* 1958, **42**, No. 12, 1382–6. [Washington Agric. Exp. Sta., Pullman]

Seed disinfection was carried out with 13 mercurial treatments, 8 formulations of BHC, 3 of PCNB and 2 non-mercurial treatments at 0·25 to 2·25 oz./bu. for the control of bunt (*Tilletia caries*) at 8 locations in Idaho, Montana, Oregon, Utah and Washington. Most of the materials tested gave good control of seed-borne bunt. Bunt originating from soil-borne spores was controlled by BHC and 2 of the 3 PCNB formulations, but not by the mercurial treatments.—J.D.J.

544 GARRETT, W. N. and others. **Effects of stem rust of different infection intensities on yield and other factors in wheat.** *Pl. Dis. Reptr* 1958, **42**, No. 11, 1237–43, bibl. 12. [Texas Agric. Exp. Sta., College Station.]

Stem rust (*Puccinia graminis tritici*) infecting plots of Lee and Bowie wheat considerably reduced yield, bushel weight and seed weight, the damage to Bowie, the more susceptible variety, being substantially greater than the damage to Lee. On plots sprayed weekly with 6 lb. maneb/ac. for 9 weeks the yield of Lee was almost twice, and the yield of Bowie more than twice, that of the control.—J.D.J.

545 BEDI, K. S. **Further studies on the control of loose smut of wheat in the Punjab.** *Indian Phytopath.* 1957, **10**, No. 2, 133–7, bibl. 3. [Govern. Agric. Coll., Res. Inst., Ludhiana, Punjab]

Soaking wheat seed in water for 4 hr., followed by exposure to solar heat for 1 hr., controlled loose smut (*Ustilago tritici*). Even a 5-min. exposure of soaked wheat seeds to sun-rays at 12 noon, reduced loose smut appreciably. Soaking wheat seed in ordinary water at room temperature and then drying it in the shade reduced loose smut by about one-third during May-June, 1953. F. S.—E.B.O.

546 DIJKSTRA, A. De invloed van de kiemkracht van zomertarwe op ontwikkeling en opbrengst van het gewas. [**The influence of germinating capacity upon the development and yield of spring wheat.**] *Landbouwk. Tijdschr.* 1959, **71**, No. 6, 176–80 ; No. 7, 197–201, bibl. 9. [LandbHogesch., Wageningen]

Ninety seed samples of Peko wheat, harvested in 1956 under unfavourable conditions, were tested in mid-March 1957 for germinating capacity, 1000-grain weight, moisture content, and infection with Fusarium wilt. Some samples were treated with Aagrano. There was no significant relationship between germinating capacity and 1000-grain weight. The percentage germination of untreated seed samples was significantly correlated with the percentage infection with Fusarium wilt. Average germinating capacity was 86% for treated, and 78% for untreated, seed. Seed samples giving 65–99% germination were divided into 8 groups on the basis of germinating capacity and sown in mid-March at 2 locations in rows 20 cm apart. Growth conditions were favourable throughout the season. Seed with low germinating capacity in the laboratory gave consistently thin stands in the field. The average number of tillers per plant was not significantly greater for seed samples with low germinating capacity, but a high proportion of tillers bore ears. The number of tillers per row and yields of grain and straw were greater for treated than for untreated seed. Grain yields were higher on peat soil than on sandy soil, and decreased with decreasing seed germinating capacity.—R.B.

547 STOCKER, O. Über die Atmung ruhender Weizenkörner in Abhängigkeit vom Wassergehalt. [**Respiration of dormant wheat grains**

**in relation to water content.**] *Angew. Bot.* 1959, **33**, No. 4, 153–8, bibl. 16. [Techn. Hochsch. Darmstadt, W. Germany]

Four varieties of *Triticum aestivum* and 1 of *T. durum* were studied. In the dormant state, respiration rate increased with increasing water content up to a maximum at about 50% moisture, then decreased as water content increased further to its maximum of about 70%. There were varietal differences, but these were not connected with genetic differences.—D.B.

548 PRIEST, Mary. **Distribution of transaminases in the wheat grain.** *Chem. and Industr.* 1959, No. 42, 1318–19, bibl. 7. [Res. Assoc. Brit. Flour Millers, Cer. Res. Sta., St. Albans]

Transaminase activity was found to be highest in the aleurone layer where there is also the highest concentration of vitamin $B_6$.—E.B.O.

549 BOURDET, A. and HÉRARD, J. Évolution des constituants phosphorés du grain de blé au cours de la maturation — acides nucléiques et synthèse protéique. [**Evolution of the P constituents of wheat grain during maturation. Nucleic acids and protein synthesis.**] *Ann. Physiol. vég., Paris* 1959, **1**, No. 1, 29–51, bibl. 43. [Lab. Biochim. et Physico-Chim. Céréales]

550 COÏC, Y. and DURANTON, J. Influence comparée du traitement vernalisant (température basse) d'un blé d'hiver et d'un blé de printemps sur les échanges gazeux respiratoires après traitement. [**Comparative influence of vernalization at a low temperature on the respiratory gaseous exchange, after treatment, of a winter wheat and a spring wheat.**] *Ann. Physiol. vég., Paris* 1959, **1**, No. 2, 113–20, bibl. 4. [Sta. Cent. Physiol. Vég., Versailles, France]

The respiratory gaseous exchanges of seeds of the spring wheat Fylgia and of the winter wheat Cappelle were measured during germination following vernalization at 1°C for 15–60 min. Without vernalization the increase in $QO_2$ ($mm^3$ $O_2$/hr.) of Fylgia during the first days of germination at 15°C was markedly greater than that of Cappelle. Vernalization had a marked effect on Cappelle, but no effect on Fylgia ; the increase in $QO_2$ of Cappelle after vernalization was in fact greater than that of Fylgia.—E.B.O.

551 CORNS, W. G. **Effects of seed treatments with gibberellin and dates of seeding on winter survival and vegetative yield of Kharkov wheat.** *Canad. J. Pl. Sci.* 1959, **39**, No. 3, 293–6, bibl. 3, illus. [Univ. Alberta, Edmonton]

Seeds of Kharkov winter wheat were soaked for 24 hr. in water or 100 ppm GA and sown at weekly intervals between 21 Aug. and 25 Sept. Plants from the first 4 sowings emerged before the winter frosts ; those treated with GA elongated more rapidly and were slightly chlorotic. By the end of April the control material showed greater leaf growth than the treated material, and more plants survived. GA reduced yields of forage and delayed earing. Delay in sowing retarded the development of both treated and untreated wheat. The differences between treated and untreated plots became greater as the sowing date was delayed.—R.B.

552 CAMPBELL, W. P. **A cause of pink seeds in wheat.** *Pl. Dis. Reptr* 1958, **42**, No. 11, 1272. [Bot. Pl. Path. Div., Canada Dep. Agric., Ottawa, Ontario]

In recent years wheat from western Canada, especially the variety Thatcher, has contained a small percentage of pink, translucent seeds. In 10 varieties of spring wheat, harvested at 4 dates from the soft dough stage onwards, pink seeds were produced in 5 out of 10 varieties when harvested while still immature. The increase in the practice of allowing the grain to mature in the swath is blamed for the occurrence of pink seed in Canadian grain.—J.D.J.

553 GIFFORD, J. R. and others. **Effects of thimet and various stickers on germination and seedling growth of wheat.** *J. econ. Ent.* 1959, **52**, No. 4, 650–4. [Kansas Agric. Exp. Sta., Manhattan]

Wheat seed, var. Pawnee, Ponca and Bison, was treated with thimet at 0·5, 0·75 or 1 lb./100 lb. seed and/or water, maize oil, groundnut oil or soyabean oil as adhesive agents, before being germinated in paper towels under laboratory conditions. Thimet plus water had no significant effect on germination. The percentage germination of Pawnee was significantly reduced by all oils used alone, and that of Ponca by soyabean oil ; that of Bison was unaffected. Thimet plus oil significantly reduced germination, compared with oil alone, except in the case of 0·5 lb. thimet + groundnut oil applied to seed of Pawnee and Ponca. Seedling survival was reduced by oil, thimet plus water at the 2 highest rates and by thimet plus oil. Where seeds were sown in soil, thimet plus water, or oils alone, had no significant effect on seedling emergence, except in the case of Bison treated with groundnut oil or the highest rate of thimet plus water ; all treatments, except one, of thimet plus oil reduced seedling emergence by 29–82·5%. Adding 1 lb. chloranil/100 lb. seed to the various treatments counteracted the reduction in germination resulting from oil treatments, but not that from thimet plus oil treatments.—R.B.

554 SARIN, M. N. and RAO, I. M. **Physiological studies on salt-tolerance in crop plants. 3. Influence of sodium sulphate**

**on seedling respiration in wheat and gram** [*Cicer arietinum*]. *Indian J. Pl. Physiol.* 1958, **1**, 30–8, bibl. 9. [Agra Coll.]

The effect was studied of 0·6% $Na_2SO_4$ solution (a harmful concentration) on the respiration, dry weight and hydration percentage (moisture content/dry weight of seedlings) of wheat- and gram-seedlings during the period 24–96 hr after sowing. $Na_2SO_4$ depressed respiratory activity in gram more than in wheat. The maximum inhibition (60-70%) occurred at 60 hr after sowing. Loss in dry weight during the experimental period was negligible. Hydration percentage decreased continuously in both crops. F. s.—D.B.

555 Fujii, Y. **On the correlation between development of the branch roots and emergence period of the leaves at the successive nodes of the main stem in wheat plants.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **27**, No. 2, 232-4, bibl. 6, illus., English summary. [Saga Univ.]

556 Maeda, E. **Studies on the mechanism of leaf formation in the crop plants. 1. Changes of structure of successive leaves in wheat.** *Proc. Crop Sci. Soc. Japan* 1959, **27**, No. 4, 451-7, bibl. 14, Japanese summary. [Nagoya Univ.]

Changes in the character of leaves emerging from successively higher nodes on a stem were studied in winter wheat by determining the size and number of abaxial epidermal leaf cells (including stomatal cells), the number of veins and the width of leaves. Observations were made on wheat grown (in pots) under natural light conditions and after vernalization. Leaves from lower nodes of vernalized plants had features in common with leaves from higher nodes of unvernalized plants. In vernalized wheat, cell length, leaf width and number of veins were smaller in winter types e.g. Norin 24 than in spring types e.g. Norin 30.—D.B.

557 Heyland, K.-U. Der Verlauf der Einlagerung von Gerüstsubstanzen und anderen Kohlenhydraten in den Spross von Weizen und Roggen zwischen Ährenschieben und Todreife. **[The course of deposition of substances giving mechanical strength and other carbohydrates in the shoots of wheat and rye between earing and the dead-ripe stage.]** *Z. Acker- u. PflBau* 1959, **108**, No. 4, 473-502, bibl. 134, English summary. [Inst. PflBau u. PflZücht., Landw, Hochsch. Hohenheim, Stuttgart, W. Germany]

This paper begins with an extensive review showing the development of the various types of methods which have been used to determine resistance to lodging. The present work is concerned with an attempt to determine rigidity of varieties from their cellulose and lignin contents and from the relationship of these to each other. The determinations were made on varieties of rye and spring wheat between appearance of the ear and full maturity, the period during which lodging is likely to occur. Special attention was given to the lower 10 cm of stem. The factors contributing to breaking strength were also considered. Results are shown in graphs. It was clear that there was a period of marked physiological activity and a change in metabolism during the period immediately before and immediately after flowering. No really useful relationship was found between lodging resistance and lignin content or cellulose content (either as a percentage or as an absolute quantity) in the lower part of the stem or the whole shoot. However, there is probably a connexion between resistance to lodging in spring wheat and lignin content of the base of the stem. The lignin/cellulose ratio in the stem up to time of flowering was related to lodging resistance. It was higher in varieties resistant to lodging, e.g. Petkuser Tetra (rye) and Breusteds Teutone (wheat) than in other varieties. The changes in straw quality (for paper pulp) as regards cellulose and lignin content from earing to full maturity are discussed ; they are dependent on variety and nutrition. In view of the physiological changes taking place in the plant, it is obvious that the cellulose and lignin contents must be determined at several intervals of time before the lodging resistance of a variety can be assessed in breeding work or in varietal trials.—D.B.

558 Nanda, K. K. and others. **Growth and phasic development of wheat. 2. Stem elongation, tillering and leaf production.** *Indian J. Pl. Physiol.* 1959, **2**, No. 1, 52–67, bibl. 27.

Growth of wheat in terms of stem elongation and leaf and tiller production is determined by the time of flowering, therefore, any treatment which affects the time of flowering affects the rate of stem elongation and the magnitude of tiller and leaf production. Thus, long-day treatment accelerates stem growth and decreases the numbers of tillers and leaves compared with normal days. Short days have the opposite effect, though the responses in tiller and leaf numbers to short days were different in 2 experiments.—R.D.W.

559 Chinoy, J. J. and others. **Growth and phasic development of wheat. 1. Vegetative period and photothermic requirement.** *Indian J. Pl. Physiol.* 1959, **2**, No. 1, 29–45, bibl. 67. [Dep. Bot., Univ. Delhi]

The " photothermic quantum " for a wheat variety is obtained by multiplying the " photo quantum " (the number of hours of light received between germination and anthesis) by the " thermic quantum " (the total degrees of mean diurnal

temperature during the same period). For 10 varieties, the photo quantum increased and the thermo quantum decreased from short-day to long-day treatments, but the photothermic quantum was not significantly different for a variety under different day-length treatments. The photothermic quanta of late-flowering varieties were greater than those of early ones, which are more photosensitive. Vernalization increased photosensitivity and thus reduced the photothermic quantum. It is claimed that this concept holds also for other crop plants such as oats, barley, linseed and gram, photothermic quanta being considered as indices of energy requirements for long-day plants.—R.D.W.

560 Riddell, J. A. and others. **Development of spring wheat : 1. The effect of photoperiod.** *Agron. J.* 1958, **50,** No. 12, 735–8, bibl. 11. [Purdue Univ., Lafayette, Indiana]

In spring wheat, var. Progress, White Federation 38, Warden and Chinese, grown at 70°F under : (a) 8 hr. light (1000 f.c.) + 8 hr. darkness, (b) 8 hr. light + 8 hr. dim light (35 f.c.) + 8 hr. darkness, (c) 16 hr. light + 8 hr. darkness, (d) 16 hr. light + 8 hr. dim light, or (e) continuous illumination, the rate of development up to flowering increased with increasing photoperiod, regardless of light intensity. Under long photoperiods, the late varieties Chinese and Warden developed many more nodes before flowering than the other varieties. Where 8 hr. light + 4 hr. darkness was given, plant development was accelerated, but a further increase in the number of photoperiodic cycles per 24 hr. accelerated development in late varieties only. Interruption of the dark period for 0·5 hr. under treatment (c) accelerated development to a greater extent than did interruption of the light period. The acceleration in development which occurred when the number of photoperiodic cycles per 24 hr. was increased was due to the interruption of the dark period. It was considered possible to accelerate the development of spring wheat grown in a glasshouse by means of a short period of illumination during the dark period.—R.B..

561 Nanda, K. K. and others. **Energy relations of crop plants. 1. The quantitative relationship between the duration of vernalization treatment and photothermic quantum in wheat.** *Indian J. Pl. Physiol.* 1958, **1,** 5–16, bibl. 35. [Univ. Delhi]

Germinated seeds of *Triticum vulgare* (var. Hansa) were vernalized for different periods (1–6 or 1–8 weeks) ; the seedlings were transplanted early (Dec.) or late (Feb.) and exposed to normal day (11 hr. average) or long (continuous) day. The effect of these conditions on the length of the vegetative period was studied. Seedlings transplanted in Dec. flowered even though unvernalized and exposed to normal day length. Those transplanted in Feb. flowered only under long day and when vernalized for at least 2 weeks. Vernalization increased the photosensitivity of wheat to such an extent that it could efficiently utilize light energy supplementary to the normal. It is postulated that, during the process of vernalization, conversion of reserve carbohydrates to sugars leads to a more efficient synthesis of ascorbic acid which, when it has reached a critical level, interacts with indole 3 acetic acid, and brings about a quicker transformation of the growing point from the vegetative to the reproductive state.—D.B.

562 Nanda, K. K. and others. **Energy relations of crop plants. 2. The quantitative relationship of stem growth in wheat with photothermic and vernalization quanta.** *Indian J. Pl. Physiol.* 1958, **1,** 17–23. [Univ. Delhi]

Stem elongation of wheat was studied when plants were grown under the conditions described in the previous abstract. After early sowing, stem elongation occurred both under long day and normal day and in unvernalized plants. After late sowing, under normal day, there was no stem elongation whatever the period of vernalization ; under long day at least 2 weeks vernalization was necessary. Highly positive correlations between plant height and spike length indicate that stem elongation can be used as an index of progress towards the developmental stage. F. s.—D.B.

563 Nanda, K. K. and others. **Energy relations of crop plants. 3. The effect of different durations of vernalization and photoperiod on tiller production in wheat and its relation with photothermic quantum.** *Indian J. Pl. Physiol.* 1958, **1,** 24–9. [Univ. Delhi]

564 van Dobben, W. H. Enige waarnemingen over de stikstofhuishouding van tarwe en maanzaad. **Some observations on the nitrogen uptake of spring wheat and poppies in relation to growth.** *Jaarb. Inst. Biol. Scheik. Onderz. LandbGew. 1959* 1959, 93–105, bibl. 6, English summary.

Peko spring wheat was grown for 66 days at 20°C under optimum moisture conditions in a glasshouse in pots each containing 5 kg soil poor in N. Each pot contained 10 plants and received 646 mg N as $NH_4NO_3$ at sowing. Some of the pots were given 700 mg additional N 36 days later, when the last leaf was visible. Fresh weight and dry weight were linearly related to N uptake for the first 29 days after sowing, and the plants contained 0·74% N on a fresh-weight basis and 6·1% N on a dry-weight basis. After 29 days' growth, available N was no longer optimum and at 32 days after sowing the ratio between fresh weight and N uptake had increased. Where no N was applied these

2 factors were correlated until the 45th day, after which no more N was absorbed. Where additional N was applied, the percentage N in the fresh material rapidly attained its original level and remained at 0·74% throughout the growing period. The ratio between dry weight and N uptake increased abruptly after 29 days' growth, at the onset of stem elongation and ear initiation, and where N was applied the linear relationship between these factors continued at the same changed rate throughout the growing period. A rapid increase in percentage moisture occurred during stem elongation. Decreases in dry matter production and N uptake at this time were similar, indicating that N shortage had no effect on dry-matter composition. In plants not receiving additional N this was no longer the case after 36 days' growth. Additional N had no effect on the length of stems or leaves, and increased dry-matter production to a small extent only. Poppies [*Papaver somniferum*] var. Nobel were grown 3 plants to a pot in the same manner as wheat for 72 days ; 210 mg N was applied at sowing and 263 mg N 51 days later. Young plants contained 0·58% N on a fresh-weight basis, 5·6% on a dry-weight basis. Fresh weight and N uptake were linearly correlated for 30 days, when the ratio between them increased as a result of N shortage. Growth, as measured by fresh-weight increase, ceased entirely when no more N was available. Dry weight, however, increased somewhat owing to accumulation of carbohydrates. Where N was applied, growth recommenced, and the original ratio of fresh weight to N-uptake and N-content was rapidly regained. On the other hand the percentage dry matter remained at a higher level than before owing to the continued presence of carbohydrates accumulated during the period of reduced growth rate. Shortage of available N occurred for the second time at 65 days after sowing. In contrast with wheat, top-dressing of poppies increased the size of leaves and gave a 4-fold increase in yield of tops.—R.B.

565 Wittenrood, H. G. Correlatie tussen plant- en aargrootte ten tijde van de aaraanleg bij tarwe. **Correlation between size of plant and ear (ultimate number of spikelets) at ear initiation in wheat.** *Jaarb. Inst. Biol. Scheik. Onderz. LandbGew. 1959* 1959, 135–46, bibl. 8, English summary.

Winter wheat, var. Bersée, Renfort, Prima, Juliana, Carstens V and Skandia III, was sown in pots in the field in Nov., and transferred 40, 56, 68, 78 and 91 days later to continuous illumination at 18°C in a glasshouse. There was a close correlation between the period of purely vegetative development in the glasshouse and the mean number of total leaves. Plant height, as measured from soil level to the highest leaf point, was related to the number of expanded leaves. During ear formation, the increase in the number of spikelets ceased when the top spikelet was differentiated. There was a close correlation between the ultimate number of spikelets and plant height at the beginning or end of ear initiation. The plants grew very little between the end of ear initiation and the onset of stem elongation. In the glasshouse, plant height and ultimate number of spikelets were correlated with the number of leaves where plant height increased at the same time as leaf number, whereas in the field, leaves were formed without increase in plant height.—R.B.

566 Hartman, T. A. De gevoeligheid van zomergranen ten aanzien van hitteperioden voor, tijdens en na de bloei. **Susceptibility of spring cereals to heat at 3 stages of development.** *Jaarb. Inst. Biol. Scheik. Onderz. LandbGew. 1959* 1959, 107–15 bibl. 6, English summary.

Petkus spring rye, Peko wheat, Herta barley and Abed Minor oats grown in pots were exposed to dry heat at 40°C for periods of 0·5, 1, 2, 4 or 8 hr. (a) 1 week before the beginning of flowering, (b) at the beginning of flowering, or (c) 1 week after the beginning of flowering. Stage (a) was most susceptible to heat damage. In stage (c) most of the spikelets were sufficiently developed to withstand short periods of heat without yield being affected. Prolonged heat first affected the younger spikelets at the tops and base of the ear, and later those in the centre, depending on their degree of development. Mature spikelets were unaffected. Spikelets damaged but not killed by heat treatment produced shrivelled grain with a low 1000-grain weight. Heat treatments of short duration tended to cause the upper and lower spikelets of rye and barley to become detached, and where applied to barley and oats before flowering, the 1000-grain weight increased.—R.B.

567 Tsitsin, N. V. and Lubimova, V. F. **New species and forms of cereals derived from hybridization between wheat and couch grass.** *Amer. Nat.* 1959, **93**, No. 870, 181–91, bibl. 6, illus. [Principal Bot. Gard., Moscow]

As a result of crossing wheat and couchgrass (*Agropyron* spp.), new winter and spring varieties of common wheat (*Triticum aestivum*) have been obtained, as well as new species of *Triticum*. One of these is the perennial wheat, *Triticum agropyrotriticum perenne* and various forms of forage wheat, *T. agropyrotriticum submittans*. After grain maturation, the plants of this species grow new shoots which may produce a second grain crop in the southern area of the Soviet Union, or a good hay crop in the central area.—E.B.O.

568 Boldyrev, N. K. [**Determination of the N and P requirements of spring wheat at the flowering stage by means of a general**

**chemical analysis of the leaves.**] [Russian] *Počvovedenie* (*Pedology, Moscow*) 1959, No. 11, 104–14, bibl. 38. [Omsk Agric. Inst.]

See also *Fld Crop Abstr.* 12 : 1678.

569 Dézsi, L. Adatok az öszi búza nitrogéntrágya szükségletének meghatározásához. **Studies on the determination of the nitrogen requirements of winter wheat.** *Növénytermelés* 1959, **8,** No. 3, 251–8, bibl. 24, English summary. [Dep. Pl. Physiol., Eötvös Loránd Univ., Budapest]

The effects of N supplies on the N content of the exuding sap and on grain yield of winter wheat were studied. Under conditions of the test it is claimed that : (1) only a fraction of the total N absorbed by the root system is converted to an organic form in the roots ; (2) if the amount of nitrate N in the root exudate is 2 or 3 times greater than that of the organic N when the plant is at the late shooting stage, further applications of N are useless ; (3) in treatments where P and K were supplied only in the autumn, maximum yield was associated with maximum N content in the exuding sap ; (4) greatest grain yields were obtained on plots receiving P and K in the spring and 200 kg of N/cadastral yoke (= 0·57 ha) during the growing season. F. Eng. s.—M.H.

570 Bacchi, O. Estudos sôbre a conservação de sementes. 3. Trigo. [**Studies on seed storage. 3. Wheat.**] *Bragantia* 1958, **17,** No. 15, 205–12, bibl. 6, English summary. [Received Aug., 1959]

Freshly harvested seeds of wheat (*Triticum aestivum*) var. Garnet-63 were adjusted to different moisture contents and stored in sealed containers at room temperature (12°–30°C). Seeds of 7·8, 9·2 and 11·1% moisture content had a germinating capacity of 96, 95 and 92%, respectively, after 30 months of storage. Seeds of 13·1% moisture content remained completely viable for 12 months, but thereafter their germinating capacity decreased markedly. The germinating capacity of seeds stored with 15·2% moisture content declined to 64% after 2 months' storage and was nil after 8 months. Seeds of 13·1% moisture content, stored in open containers at room temperature, had a germinating capacity of 80% after 6 months, and 62% after 8 months ; their moisture contents varied between 10·5 and 15·9% during the trial.—E.B.O.

571 Black, C. J. **Wheat costs in Yorkshire 1956-57.** *Fmrs' Rep. 141 Dep. Agric., Econ. Sec., Univ. Leeds,* 1959, pp. 24, mimeo.

This survey analyses the profit margins from wheat grown in two contrasting areas of Yorkshire, the Vale of York and Helmsley. The best margins were not always obtained by reducing costs. It is suggested that further refinements in field husbandry have to be evolved before the newer varieties of wheat realise their full potential.—J.D.J.

## BUCKWHEAT

572 Elagin, I. N. [**The origin of *Fagopyrum.***] [Russian] *Bot. Ž. SSSR* (*Bot. J., USSR*) 1959, **44,** No. 8, 1177–81, bibl. 24. [All-Union Acad. Agric. Sci., Moscow]

Works concerned with the history of this genus [including buckwheat] are reviewed and its distribution in regions of the USSR is described (map included). Sowings are concentrated primarily on degraded black-earths, and on argillaceous, sandy, podzolic or peaty soils in regions with adequate moisture in summer (temperate climate belt) from the western boundaries of the Union to the coast of the Far East.—M.H.

## OATS

*See also Abs. 566, 593, 698, 702, 704, 891, 910, 917, 942.*

573 Kent, N. L. and Rodger, J. B. A. **The yield and quality of oats in east-central Scotland trials 1952-55.** *Agric. Progr.* 1958, **33,** pp. 96–103, bibl. 3.

The results are discussed of trials at 18 centres in Angus, Fife, Kinross and Perth with 23 varieties of oats, in which straw length, lodging, earliness of ripening and mildew (*Erisyphe graminis*) infection were investigated.—S.M.J.

574 Ghisleni, P. L. Risultati di un quadriennio di esperienze sulla tecnica colturale dell'avena (*Avena sativa* L.) in veste di cereale. [**Results from cultural trials over 4 years with oats** (*A. sativa*).] *Ann. Accad. Agric. Torino* 1958–9, **101,** pp. 9, bibl. 11. [Ist. Agron. Univ. Torino, Italy]

In plot trials in 1955–8 with the oat variety Ava, in which seed rates of 100, 125, 150 and 175 kg of seed/ha were tested, the highest seed rate gave the highest yields of grain and straw (average 2353 and 3810 kg/ha, respectively, for the 4 years). There was no appreciable difference between broadcasting the seed and sowing in twin rows. In other trials in 1955 and 1957–8, the application of a NPK (12–5–10) fertilizer at 1000 kg/ha before sowing was effective, while sowing late, about 15 Mar., resulted in lower grain yields compared with sowing in mid- or late-Feb. [See also *Fld Crop Abstr* 13 : 56].—E.B.O.

575 Sonnema, M. and Schoot Uiterkamp, G. A. Invloed van legering op de zaadopbrengst van haver. [**Effect of lodging on grain yields in oats**] *LandbVoorl.* 1959, **16,** No. 10, 572–4, illus.

Spring oats, var. Civena, were grown with 60 or 80 kg N/ha on land sown the previous year to spring barley with or without a catch crop of turnips for green manure which received 0, 40, 80 or 120 kg N/ha. A thunderstorm 1 month before harvest caused lodging on most plots. Yield losses due to severe lodging were approximately 450 kg grain/ha at both levels of N. Percentage lodging increased (a) where the level of N was increased from 60 to 80 kg/ha, (b) with green manuring as opposed to no green manuring, (c) with increasing N applications to the green manure crop. Grain yields were increased, in all instances except one, by increasing the N applied to the oats from 60 to 80 kg/ha, despite the resulting increase in lodging. —R.B.

576 Blackmon, C. R. **Hull-less oats—pros and cons.** *Maine Fm Res.* 1959, **7**, No. 3, 13–14, illus.

In contrast with many oat varieties, James yields naked grain when threshed and therefore provides better feed for poultry. Over a 3-yr period it yielded 41·2 bu./ac., compared with 55·9 bu./ac. for Clinton and 69·6 bu./ac. for Garry, while on a grain-only basis, Clinton and Garry yielded 39·1 and 48·7 bu./ac. respectively. Oat varieties with free grain tended to lodge badly and were less resistant to disease than other varieties.—R.B.

577 Toms, W. J. **Avon—an oat variety resistant to Mn deficiency.** *J. Dep. Agric. W. Aust.* 1959, **8**, No. 5, 523, illus.

In an experiment at Mouliyinning in 1958, the application of 42 lb. $MnSO_4$/ac. to Avon oats resulted in a yield increase of 6 bu./ac. Although the variety Avon is resistant to Mn deficiency, it is recommended that Mn should be applied to land acutely deficient in Mn, even when Avon is grown. See also *Herb. Abstr.* 11 : 1535 and 12 : 42. —S.M.J.

578 Farrar, L. L. **Preliminary studies on yellow-leaf of oats in Georgia. 1. An aphid transmissible virus.** *Pl. Dis. Reptr* 1958, **42**, No. 11, 1229–36, bibl. 7, illus. [Georgia Agric. Exp. Sta., Experiment, Georgia]

The symptoms of yellow-leaf and the damage it causes to oats in Georgia are described, together with the steps taken to eliminate the pathogens and environmental factors which may cause this disease. Appearance of symptoms was prevented by spraying with thimet to kill aphids. The disease was capable of being transmitted by the apple grain aphid [*Rhopalosiphum prunifoliae*], indicating that a virus was responsible.—J.D.J.

579 Frey, K. J. and Browning, J. A. **Yield losses from atypical oat blast in central Iowa in 1957.** *Proc. Iowa Acad. Sci.* 1959, **66**, 129–36, bibl. 10, illus.

Oat blast occurring in central Iowa in 1957 differed from normal blast in that the upper or middle or lower portion of a given panicle was blasted while the remainder of the panicle remained healthy, or the whole panicle was blasted. Stems bearing blasted panicles did not lodge. The severity of blasting was related to the date of heading ; oats heading on 8 or 9 June were free from blast, those heading on 10 or 11 June exhibited 14% blasted panicles, those heading on 14 June 24% blast, and those heading on 15–21 June 19% blast. The percentage of blasted spikelets per panicle was highest in plants which headed on 14 June. Yield losses ranged from 7·2% for varieties heading on 10–11 June to 14·6% for those heading on 14 June. Cold, cloudy weather between 10 and 27 May was considered to be the cause of blasting. —R.B.

580† Wiggans, S. C. **Total protein in several oat varieties grown in Iowa.** *Proc. Iowa Acad. Sci.* 1959, **66**, 143–4, bibl. 4.

The percentage of total protein (N × 6·25) in oat grain with and without hulls is given for 14 oat varieties grown in Iowa in 1957.—R.B.

581 Gonzalez, C. L. and Frey, K. J. **Effect of seed size and hulls upon X-ray sensitivity of oat seeds.** *Proc. Iowa Acad. Sci.* 1959, **66**, 123–8, bibl. 3.

Grain of Bonham oats containing 13·8% moisture, with lemmae and paleae removed, were given 25,000, 30,000, 35,000 or 40,000 r. X-radiation. Dosages greater than 30,000 r. decreased the percentage germination of small-sized grains to a greater extent than that of larger grains. Heights of seedlings from grain given 35–40 thousand r. were reduced by 55% in the case of large grain and by 35% in small grain, while 25,000 r. had no differential effect on seedling height. Uniformly-sized grain of Bonham, Mo. 0–205 and Simcoe oats at 13·8% moisture, with or without lemmae and paleae, were given 30,000 r. X-radiation. Irradiation reduced percentage germination to a greater extent where the seed was dehulled.—R.B.

582 Abrams, R. **Effects of X-ray radiation on oat seed.** *J. Agric. Univ. P.R.* 1957, **41**, No. 4, 242–58, bibl. 4.

Oat grains of 6 varieties at several moisture contents were given 0, 15, 20, 30 or 40 thousand r. X-radiation. Recurrent irradiation of oat seed in successive generations tended to increase their sensitivity to X-rays as measured by the number of seed killed. Where oats containing 20% moisture were given 30,000 r., seed irradiated in 2 or 3 successive generations produced taller and more vigorous seedlings than seed irradiated once only,

whereas oats given 40,000 r. at 14% moisture did not show this effect. The greatest reduction in plant height, seedling vigour and percentage germination occurred where seed with a high moisture content was treated with the lowest dosage of irradiation. F. s.—H.L.B.

583 Mer, C. L. **A study of the growth and photoperceptivity of etiolated oat seedlings.** *J. exp. Bot.* 1959, **10**, No. 29, 220–32, bibl. 20, illus.

During investigations with intact oat seedlings, $CO_2$ and ethanol increased photoperceptivity, while copper-glycine in darkness promoted mesocotyl growth and induced root formation. F. s.—S.M.J.

584 Arland, A. and Zwicker, Ruth. Anwelktranspiration und Hydratur verschieden mit Kalium ernährter Haferpflanzen unter besonderer Berücksichtigung des Jahresrhythmus. [**Transpiration at onset of wilting and turgidity of oat plants grown in solutions containing different concentrations of potassium, with special reference to the yearly rhythm.**] *Z. Acker- u. PflBau* 1959, **108**, No. 4, 449–72, bibl. 41, illus., English summary. [Inst. Acker- u. PflBau, Univ. Leipzig, E. Germany]

585 Frey, K. J. **Yield components in oats. 4. Effect of delayed application of nitrogen.** *Proc. Iowa Acad. Sci.* 1959, **66**, 137–42, bibl. 5.

Oats sown at 3 bu./ac. were given 20, 40 or 80 lb. N/ac. at sowing or 2, 4 or 6 weeks later. Delayed N application (a) increased grain yields only where 40 lb. N were applied 2 or 4 weeks after sowing, (b) increased the number of panicles per plant where 40 or 80 lb. N were applied, but decreased it where 20 lb. N were applied, (c) increased the number of grains per panicle where 40 lb. N were applied 2 weeks after sowing, and decreased it in all other treatments, and (d) decreased the weight per seed only where 80 lb. N were applied.—R.B.

586 Toms, W. J. **The use of nitrogen fertilizers for cereals in the Jerramongup-Gairdner river districts of Western Australia.** *J. Dep. Agric. W. Aust.* 1959, **8**, No. 5, 619–20, illus.

Yields of 44·5 bu./ac. were obtained from oats grown on reclaimed scrub plain areas in W. Australia which received 56 lb. $(NH_4)_2SO_4$/ac. On such land it is recommended that $(NH_4)_2SO_4$ should be used in combination with rates of 187 lb. Cu-Zn-superphosphate/ac. Such fertilizer treatment resulted in the production of more straw for burning to control weed-suckers and toxic plants. —S.M.J.

## RYE

*See also Abs. 557, 566, 698, 942.*

587 Dodds, M. E. **The effect of swathing at different stages of maturity on the bushel weight and yield of fall rye.** *Canad. J. Pl. Sci.* 1959, **39**, No. 4, 477–82, bibl. 7. [Exp. Fm., Swift Current, Saskatchewan]

Swaths of Antelope winter rye were cut when the moisture content of the grain was approximately 50% and at frequent intervals thereafter until the grain contained approximately 14% moisture. The swaths were threshed when the grain contained 14% moisture or less. Analysis of 4 years' data indicated that rye could be swathed at 45% grain moisture without affecting yield or bushel weight. There were significant negative correlations between grain moisture content at the time of swathing and bushel weight, 1000-grain weight and yield where the grain moisture content at swathing exceeded 40%. Swaths could be cut at 45% grain moisture at least 9–10 days before normal combine-harvesting was possible. Grain matured well in the swath, was less subject to weather damage than when standing, and required 7–9 days of field drying before threshing.—R.B.

588 Skripčinskiĭ, V. V. [**Biological features and the prospects of utilizing spring and winter forms of perennial rye.**] [Russian] *Doklady Akad. Nauk, SSSR* (*Proc. Acad. Sci., USSR*) 1959, **129**, No. 3, 691–4, bibl. 1.

This work continues that recorded in *Fld Crop Abstr.* 11 : 1727. The data show that the spring perennial rye described is able to fruit when sown either in spring or autumn ; its reproductive development is retarded in short photoperiods and the crop overwinters successfully.—M.H.

589 Purvis, O. N. and Hatcher, E. S. J. **Some morphological responses of cereal seedlings to vernalisation.** *J. exp. Bot.* 1959, **10**, No. 29, 277–89, bibl. 14.

After winter and spring types of Petkus rye were vernalised in moist sand at 1°C for 58 days, the coleoptile and early leaves were shortened and hair development on the leaf sheaths was suppressed. Devernalisation by heat accentuated rather than reversed the morphological responses. F. s.—S.M.J.

590 Listowski, A. and Jesmianowicz, M. Weitere Versuche über den Einfluss der Jarowisation und des Kurztages auf die Entwicklung des Roggens. [**Further experiments on the influence of vernalization and short-day on development of rye.**] *Züchter* 1959, **29**, No. 6, 276–9, bibl. 7. [Inst. PflBau, Düngung und Bodenkunde, Pulawy, Poland]

These results confirmed those of earlier experiments that short-day treatment given after formation of the 2nd leaf delayed the onset of the reproductive phase and reduced grain yields [see also *Fld Crop Abstr.* 12 : 602]. The extent of the delay varied under different circumstances such as different duration of short-day treatment, temperature, sowing date, or length of vernalization period. F. Ger. s.—D.B.

591 AGUADO, M. M. and MARTÍNEZ, V. M. Estudio morfológico y anatómico de los centenos españoles. [**Study on the morphology and anatomy of Spanish ryes.**] 1959, pp. 227, illus., Madrid : Inst. Nac. Invest. Agron. [Review seen in *An. Edafol. Fisiol. veg.* 1959, 18, No. 9–10]

592 AGUADO, M. MERCEDES. Efectos del fósforo radiactivo sobre plantas de centeno. [**Effects of radioactive P on rye plants.**] *Bol. Inst. nac. Invest. agron.* 1959, **19,** No. 40, 89–118, bibl. 33, illus., English and French summaries.

593 van DOBBEN, W. H. Resultaten van proefnemingen met late stikstofoverbemestingen in 1958. [**Results of experiments with late nitrogen top-dressings in 1958.**] *Stikstof* [Dutch edn] 1959, **2,** No. 22, 327–37, illus.

Winter rye grown on sandy soil was fertilized with 0, 20, 40, 60, 80, 100 or 120 kg N/ha in spring, and 0, 20, 40 or 60 kg N/ha at the onset of flowering ; in no case did the total N application exceed 120 kg/ha. For given total rates of N, split applications in spring and at flowering resulted in higher grain yields than single applications at either time. Increasing applications of N in spring increased yields of straw but decreased straw strength, while increasing applications of N at flowering increased both yield and strength. In further experiments on the same soil type, oats, var. Marne, yielded as much grain as did rye where given 0 or 20 kg N/ha in spring, but considerably less than rye where given 40 kg. The increase in yield obtained with late top-dressings of N was much less in oats than in rye. In pot experiments it was shown that in the case of rye, 4% of the total increase in plant weight caused by N top-dressing was in the form of roots, whereas in barley 33% was in the form of roots.—R.B.

594 ZILLMANN, K.-H. Frühzeitige Ertragsprognose beim Winterroggen. [**Early forecast of the yield of winter rye.**] *Z. Acker- u. PflBau* 1959, **109,** No. 1, 79–94, bibl. 22, English summary. [Inst. Acker- u. PflBau, Humboldt-Univ., E. Berlin]

The method is based on the influence of weather on the 3 yield components : ears per $m^2$, grains per ear, and 1000-grain weight. The forecast can be made at ear elongation because by then the first 2 of these components are already determined and the third is partly so. In the first part of the method, a study is made of the influence of autumn weather on winterhardiness, date of beginning of growth and the periods during which the various developmental stages are attained. The periods are expressed in ' Pentaden ' i.e. 5-day spells. The second part of the method examines the effect of weather, from the beginning of growth to ear elongation, on the yields obtained in a long-term experiment with winter rye grown under 4 intensities of manuring. The temperature mean and the sum of the rainfall for each pentade together with the fluctuations from the norm are used to calculate a weather cypher. This is suitably corrected according to the weather of the previous autumn. The corrected weather cypher is positively (but not linearly) correlated with yield. The actual yields obtained in 1956 and 1957 (but not in 1958) agreed with the yields forecast by this method at ear elongation.—D.B.

## BARLEY

*See also Abs. 566, 698, 702, 704, 707, 887, 888, 903, 911, 917.*

595 WILTEN, W. and COENRADIE, J. De veldproeven in 1958. [**Field trials (with spring barley) in 1958.**] *Jaarb. NaCoBrouw* 1959, **23,** 56–72, English summary.

Varietal trials in N. Beveland were carried out on soil fertilized with sufficient N to induce slight lodging. Under these conditions, Carlsberg II, MGH 55026 and MGH 55045 gave higher yields than Balder. Proctor, Piroline, Svalöf 50/102, Union, Mentor (Abed 978), Delta, Ingrid, MGH 367/51, Volla and Wisa gave yields similar to those of Balder, while Kenia and Beka gave lower yields. The new varieties MGH 55026 and 55045 were intermediate in maturity between Balder and Union. MGH 55045 was somewhat earlier than MGH 55026 and had rather stiffer straw. Mentor was not true-to-type and appeared to produce 2 types of seed. None of the varieties in the trial was outstandingly better than Balder. In large-scale field trials with Balder, Proctor and Ingrid in S. Holland, Brabant, S. Limburg and Zeeuwsch-Vlaanderen, Ingrid flowered earliest, Balder 1 or 2 days later than Ingrid, and Proctor 5–7 days later. Lodging tended to begin about 20 June ; Ingrid lodged least, and Proctor most, except in Zeeuwsch-Vlaanderen where the reverse occurred. Proctor produced the best yields in Zeeuwsch-Vlaanderen and the worst elsewhere. The malting quality of the barley grown in S. Limburg was outstanding, as in 1957. [See *Fld Crop Abstr.* 11 : 958]. Domen was sown at rates of 100, 150 and 200

kg/ha in rows spaced 12·5 and 25 cm apart ; the higher seed rates increased yields to a limited extent only. Shading-trials with cages which intercepted 65% of the light were carried out with Balder at the tillering, shooting and grain-formation stages. Early shading considerably reduced the number of tillers per plant. Shading during shoot formation increased straw length and lodging, and induced strong secondary growth. Shading at any of the 3 stages reduced grain yields. Top-dressing Balder on clay soil with 40 kg N/ha on 12, 19 or 26 June increased yields by 4% irrespective of the date of application ; such top-dressings are not recommended.—R.B.

596 Wilten, W. Gerstverbouw in Portugal. **Malting barley in Portugal.** *Jaarb. NaCoBrouw* 1959, **23**, 39–44, English summary.

Barley is one of the less important grain crops in Portugal. Aurore, Beka, and the Argentinian variety Lima Monteiro are at present cultivated for malting. In experimental plots fertilized with 40 kg N, 60 kg $P_2O_5$ and 60 kg $K_2O$/ha, Lima Monteiro yielded 3000 kg grain/ha, more than double the average yield for the country. Desirable characteristics in a barley variety for Portugal are early ripening and resistance to disease and to excess water in winter.—R.B.

597 Institut National pour l'Étude Agronomique du Congo Belge. [**Malting barley.**] *Rep. INÉAC 1958*, 1959, 439. [Centre Exp. de la Ndihira, Northern Kivu]

The malting barley varieties Research, Proctor and Abed-Kenia yielded 1900–2500 kg grain/ha. Yields were higher where malting barley was grown after beans or peas than after potatoes. Preliminary trials indicated that the best sowing dates are 15 Feb. and 1 Sept.—E.B.O.

598 Vanden Born, W. H. and Corns, W. G. **Studies on seed dormancy, plant development and chemical control of Tartary buckwheat (*Fagopyrum tataricum* (L) Gaertn.) 3. Chemical control and effects of competition.** *Canad. J. Pl. Sci.* 1959, **39**, No. 1, 63–70, bibl. 9. [Div. Crop Ecology, Univ. Alberta, Edmonton]

Barley, artificially infested with Tartary buckwheat, was treated in 1956 with MCPA butyl ester and the ethyl and butoxy ethanol (low-volatility) esters of 2,4-D, 20 days after sowing at 0–16 oz./ac., and 12 days later at 4 oz./ac., and in 1957 with both esters of 2,4-D at 4–12 oz./ac., 2,4-DB at 8–24 oz./ac., and neburon at 2·5-10 lb./ac., either 14 or 24 days after sowing. In 1956, 2,4-D butoxyethanol ester gave more effective weed control than 2,4-D ethyl ester and both were better than MCPA. Applications of 4 oz. 2,4-D esters/ac. on both dates were less effective than a single early application of 8 oz./ac. In 1957, both 2,4-D esters were equally effective in reducing weed growth, but the early application of the butoxyethyl ester caused the greater injury to barley. 2,4-DB at 8 oz./ac. gave weed control equal to 2,4-D, but was less injurious to the crop. The highest yields of barley and maximum weed control were obtained with early applications of neburon (10 lb./ac.). Buckwheat plants at a stand density of 100/sq. yd, present only for 3 weeks after sowing in the field, had no significant effect on barley yield. Where buckwheat was present throughout the growing season, barley yield decreased with increasing weed density. Treatment with 2,4-D butoxyethanol ester at 8 oz./ac. 3 weeks after sowing slightly decreased barley yields only where $< 25$ buckwheat plants/sq. yd were present ; where 50 or 100 weeds/sq. yd were present, yields were lower on unsprayed plots.—R.B.

599 Bedi, K. S. **Control of loose smut of barley with solar heat in the Punjab plains.** *Indian Phytopath.* 1957, **10**, No. 2, 138–41, bibl. 1. [Govern. Agric. Coll., Res. Inst., Ludhiana Punjab] [Seen Dec., 1959]

Exposure to solar heat effectively controlled loose smut of barley (*Ustilago nuda*), and did not harm the viability of the treated seed.—E.B.O.

600 Kamra, O. P. **Radiation response of barley seeds in relation to hydration and to chemical substances lost by leaching.** *Diss. Abstr.* 1960, **20**, No. 3, 839–40. [Washington State Coll., Pullman]

601 Kemp, J. G. and others. **A small barley de-awner.** *Canad. J. Pl. Sci.* 1959, **39**, No. 2, 241–5, bibl. 1, illus. [Can. Dep. Agric., Ottawa, Ontario]

An illustrated description is given of a barley de-awning machine suitable for handling samples of seed weighing 5–30 g. The apparatus can also be used to measure the relative de-hulling characteristics of barley varieties and for the threshing of single seed heads of cereals and other plants.—R.B.

602 Yin, H. C. and others. **Maltose transformation in the ripening and germinating grains.** *Scientia sinica* 1959, **8**, No. 9, 1022–9, bibl. 19, illus. [Inst. Pl. Physiol., Academia Sinica, Shanghai]

In the ripening grains of barley and wheat, maltose increases from flowering to harvest simultaneously and proportionally with the increase in the activity of β-amylase. No maltose was detected in ripening grains of rice, not because of inactivity of amylase but because of rapid trans-

formation of the maltose formed. In germinating grains of wheat, barley, maize and rice, maltose was found only in the endosperm and not in the seedling. The results of various chemical reactions are discussed in connexion with the role of maltose in plants and its transformation during mobilization of starch reserves. F. s.—D.B.

603 Helder, R. J. **Absorption and distribution of labelled rubidium ions in young intact barley plants.** *Nuclear Sci. Abstr.* 1959, **13,** No. 8 supplement, 813. [State Univ. Groningen, Netherlands]. [Abstr. of Paper presented at 2nd U.N. Conf. Peaceful Uses of Atomic Energy]

Owing to the similarity between K and Rb ions, information about the behaviour of K ions can be obtained from experiments with Rb salts. Where barley plants were grown for a short time in various salt solutions, marked differences were found in subsequent Rb absorption by the roots. Only a small proportion of absorbed Rb proved to be exchangeable.—R.B.

604 Lefebvre, J. M. Étude des variations des substances azotées au cours de la végétation de l'orge. 1. Étude de la germination. 2. Étude de la formation de l'épi et de la maturation du grain. [**Study of the changes in the N substances during the growth of barley. 1. Study of germination. 2. Study of ear formation and grain maturation.**] *Ann. Physiol. vég., Paris* 1959, **1,** No. 1, 93–109, bibl. 25, illus., and No. 2, 137–62, bibl. 51. [Sta. Cent. Physiol. Vég., Versailles, France]

The first study was carried out with barley seeds germinated at 6°, 12° and 25°C. In the second study, 3 principal periods during the formation and maturation of grain were distinguished : (a) period before flowering ; (b) from flowering to the milk-ripe stage ; (c) from the milk-ripe stage to grain maturation. During period (c) the formation of protein soon ceases. The application of N at shooting results in the active formation of protein being continued.—E.B.O.

605 Gardner, H. W. **Manuring barley on chalk. Nitrate of soda *v.* sulphate of ammonia.** *Agriculture, Lond.* 1959, **66,** No. 9, 396–7, bibl. 1. [Pitstone Green Fm, Tring, Herts]

In a comparison of the effects of ammonium sulphate and sodium nitrate, each at 0·42 and 0·84 cwt. N/ac., on the yield of spring barley, the average grain yield increases due to sodium nitrate were 2·75 cwt./ac. higher than those due to ammonium sulphate, in the wet summer of 1958. In the dry summer of 1959, sodium nitrate gave 7 cwt. more grain per ac. than did ammonium sulphate. The effect of the sodium present was shown to be negligible.—A.M.H.

## MAIZE

*See also Abs. 602, 633, 702, 704, 712, 891, 900, 933, 1013.*

606 Fenaroli, L. La produzione delle sementi ibride di mais in Italia con particolare riguardo all'esportazione. [**The production of hybrid-maize seed in Italy particularly with regard to exports.**] *Publ. 96 Sta. sper. Maiscolt. Bergamo* 1959, pp. 15.

607 Stringfield, G. H. **Performance of corn hybrids in mixtures.** *Agron. J.* 1959, **51,** No. 8, 472–3. [Ohio Agric. Exp. Sta., Wooster]

Maize of 24 varieties was grown as pure stands of a single variety or as mixed stands using any 2 varieties at 2 locations in Ohio in 1945 and 1946. Yields from mixed stands of similar or dissimilar varieties did not exhibit any measurable advantage or disadvantage over the average yields of the contributing hybrids when grown separately.—J.D.J.

608 Dungan, G. W. and others. **Corn plant population in relation to soil productivity.** *Advanc. Agron.* 1958, **10,** 435–73, bibl. 10. [Univ. Illinois, Urbana]

This paper reviews the effects of the population and distribution of maize plants under field conditions on yield of grain and crop residues, plant characteristics, lodging and manurial requirements.—R.B.

609 Stringfield, G. H. and Haynes, J. L. **Wide corn-row spaces and wheat interseedings.** *Agron. J.* 1959, **51,** No. 7, 390–1, bibl. 6, illus. [Ohio Agric. Exp. Sta., Wooster]

The late-maturing hybrid maize variety Ohio W64 grown in rows 72 in. apart yielded 10–15 bu./ac. less than the early variety Ohio M15 (which ripens 1 week earlier than Ohio W64) grown in rows 42 in. apart. On plots where the 72-in. row-spacing was used, Seneca winter wheat was sown between the maize rows as follows : (a) on about 25 Sept. on plots of Ohio W64, or (b) on about 7 Dec. on plots of Ohio M15, after the maize had been harvested. Treatment (a) resulted in 2 bu./ac. higher wheat yields than (b) on well drained silt loam and 13 bu./ac. higher yields than (b) on poorly drained, lacustrine soil. Treatment (a) on the latter soil was the most profitable practice.—P.J.B.

610† Haynes, J. L. and others. **Effect of corn planting pattern on yield, root extension, and interseeded cover crops.** *Agron. J.* 1959, **51,** No. 8, 454–6. [Ohio Agric. Exp. Sta., Wooster]

Ryegrass and lucerne for winter soil cover were intersown in maize sown at 21,000 seeds/ac. (a) in

rows drilled 42 (standard) or 63 in. apart, (b) at intervals of 42, 49, 56, or 63 in. in rows 42 in. apart, or (c) at intervals of 42 × 42, 49 × 49, and 56 × 56 in. Compared with 42-in. rows, the best improvement in forage stand per bu. reduction in maize yield was obtained where maize was drilled in rows 63 in. apart. There was no advantage in using methods (b) or (c).—J.D.J.

611 Mortimore, C. G. **Kernel moisture and yield of corn as influenced by pre-harvest foliar desiccation.** *Canad. J. Pl. Sci.* 1959, **39**, No. 1, 39–42, bibl. 7. [Can. Dep. Agric., Harrow, Ontario]

Maize was defoliated in mid-September 1956 and '57 with 12% aqueous cyanamide solution. Stalks from treated and untreated plots were cut 6 in. above ground level and stooked on water-proof paper in the field. The moisture content of the grain was measured at weekly intervals until the uncut plots were harvested in late October. In 1956, grain dried more rapidly during the second and subsequent weeks following treatment on sprayed than on untreated plots, but the difference in grain moisture content between treatments, though significant, did not exceed 3·3%. The moisture content of stooked maize was lower than that of the untreated standing maize on only one sampling date, at which time the moisture content was still above 35%. In 1957, grain dried at the same rate regardless of treatment. Foliar desiccation and stem-cutting had approximately the same effect on yields, namely a reduction of 14·9% in 1956 and 11·4% in 1957.—R.B.

612 Institut National pour l'Étude Agronomique du Congo Belge. [**Maize.**] *Rep. INÉAC 1958*, 1959, 205, 252, 353–4, 370, 449–50, 468 and 496–7.

At Mvuazi, Lower-Congo, the double hybrids 2020, 2021, 2028, 2025 and 2027 yielded 3230–3860 kg dry grain/ha which was more than the yield of the control Gan Fl (2470 kg). In a varietal trial at Bena Longo, Kasai, the variety Masangu ya Mpembe was best and yielded 3066 kg dry grain/ha. The variety GPS 2 is being multiplied in the farming area of Bakwa Mulumba, and the variety Gan Improved is being multiplied at Lubariba. In trials at Nioka, Ituri, the synthetic population Mahani was better than several single and double hybrids ; Mahani is suitable for cultivation at 1000–2170 m alt. At Mont Hawa, the local variety Mbeleemva yielded 3022 kg dry grain/ha. At Kisozi the variety Kisozi, which yielded 4088 kg dry grain/ha, is being multiplied.—E.B.O.

613 King, S. M. **Evaluation of silage corn production at the Upper Peninsula Experiment Station.** *Quart. Bull. Mich. Agric. Exp. Sta.* 1959, **42**, No. 2, 310–6, bibl. 2 in text, illus.

Michigan 160 and Michigan 250 maize was grown for silage in 1956–8 on silt loam soil in the Upper Peninsula area of Michigan at populations of over 16,000 plants/ac. Average yields of silage on a wet weight basis were 13·3 tons/ac. Michigan 250 gave the highest yields during 1957, a dry year, and Michigan 160 gave the highest yields during the other 2 years. Highest yields were obtained where NPK was applied at or before sowing and herbicides were used. Simazin at 4 lb./ac. gave better weed control than 1·5 lb. 2,4-D/ac. in 2 applications.—R.B.

614 Parker, D. T. and Burrows, W. C. **Root and stalk rot in corn as affected by fertilizer and tillage treatment.** *Agron. J.* 1959, **51**, No. 7, 414–7, bibl. 13. [Iowa Agric. Exp. Sta., Ames]

Maize grown under irrigation was given (a) 64 lb. $P_2O_5$/ac., 0 or 95 lb. N/ac. and 0 or 42 lb. $K_2O$/ac ; (b) N, $P_2O_5$ and $K_2O$ at 120, 60 and 100 lb./ac., respectively. Several methods of seed-bed preparation were used, including ploughing-in crop residues or leaving them on the soil surface. The latter practice decreased the incidence of root and stalk rot (probably caused by *Gibberella zeae*), as did low levels of N, but growth and maturation were delayed. Applied K decreased infection to a small but significant extent. There was a direct correlation between the N : K ratio in leaf tissue and the incidence of disease. Applied N increased yield despite the increased incidence in infection. It was not possible to determine the effect of disease on yield.—R.B.

615 Portères, R. Les appellations des céréales en Afrique. 8. Le maïs ou " blé des Indes ". [**The names given to cereals in Africa. 8. Maize.**] *J. Agric. trop. et Bot. appl.* 1959, **6**, No. 1–3, 84–105.

[See also Abs. 640.]—E.B.O.

616 Ripan, R. and others. Recherches sur la pénétration du zinc dans les caryopses et les semences au moyen de leur traitement par $ZnSO_4$ marqué avec du zinc radioactif 65. [**Research into the penetration of zinc into caryopses and seeds by means of treatment with labelled $ZnSO_4$.**] *Nuclear Sci. Abstr.* 1959, **13**, No. 8 supplement, 809. [Univ. Victor Babeş, Cluj, Romania] [Paper presented at 2nd U.N. Conf. Peaceful Uses of Atomic Energy]

$^{65}Zn$ ions in aqueous solution penetrated slowly into the caryopses of *Zea mays*. The rate of penetration was increased by increasing the concentration of the solution. $^{65}Zn$ accumulated to a greater extent in the endosperm than in the cotyledon.—R.B.

617 Ingold, M. Le ' Cold Test ' appliqué à la germination des semences de maïs. [**The**

**application of the 'cold test' to germination of maize seed.**] *Landw. Jahrb. Schweiz* 1958, **72,** 445–56, bibl. 17, illus. German, English and Italian summaries. [Stat. Fédérales d'Essais Agricoles, Lausanne]

The cold test using sand was better than the cold test using soil when determining germination capacity of maize seed. Results by the former were reproducible. The seeds, embedded in moist sand in an aluminium dish, were kept for 7 days at 12°C and 7 days at a temperature varying between 20 and 30°C. Results from the cold test multiplied by results from the normal (paper-roll) method gave an index figure which was closely correlated with field emergence.—D.B.

618 Glover, J. **The apparent behaviour of maize and sorghum stomata during and after drought.** *J. agric. Sci.* 1959, **53,** Pt 3, 412–6, bibl. 4. [E.A.A.F.R.O., Kenya]

Maize stomata are shown to be markedly affected by severe drought lasting about a week or more, in that they do not recover their apparent pattern of normal behaviour after restoration of the water supply, although the leaves regain turgidity and seem normal. On the other hand, sorghum stomata recover well from severe drought lasting 14 days and their recovery follows fairly closely behind the restoration of turgidity to the leaves. It is suggested that this difference in ability of stomata to recover from severe drought, accounts, in some measure, for the superiority of sorghum as a grain crop in dry regions. Severe drought in maize is shown to be less damaging to the young plant than to the old, because the stomata of the unopened leaves behave normally when unfolded after the drought period ends. F. S.—S.M.J.

619 Sass, J. E. and Loeffel, F. A. **Development of axillary buds in maize in relation to barrenness.** *Agron. J.* 1959, **51,** No. 8, 484–6. [Iowa Agric. Exp. Sta., Ames]

Detailed study of the formation of floral organs in 3 single crosses and 4 inbred lines of maize grown at 12,000 and 24,000 plants/ac. showed that there was no marked retardation due to competitive pressure until about 74 days after sowing. Barrenness was attributed to failure of the silks to emerge during the pollen-shedding period.—J.D.J.

620 Mao-Hua, W. and others. **Study on the vitality of pollen and stigma, and flowering in maize.** [Chinese] *Acta Agric. sinica* 1959, **10,** No. 2, 121–8, bibl. 11, illus.

621 Čžen Peĭ-Jao. [**Growth and development of spring and summer maize near Peking.**] [Chinese] *Acta Agric. sinica* 1959, **10,** No. 4, 283–95, bibl. 28, Russian summary.

622 Bajai, J. Összefüggés a kukorica levélfelülete és a tenyészterület különféle alakja között. [**Correlations between ground area and leaf surface area in maize sowings.**] *Növenytermelés* 1959, **8,** No. 3, 217–22, English summary. [Agric. Res. Inst., Martonvásár, Hungary]

Greatest leaf surface area was obtained when maize was sown at 70 × 50 cm (0·35 m²), and was only slightly less where spacings of 100 × 35 cm (0·35 m²) or 130 × 27 cm (0·36 m²) were used. Spacing the plants at 160 × 22 cm (0·35 m²) resulted in a reduced leaf surface area (only 86% of the maximum), and 260 × 40 × 23·5 cm (sown in twin lines) was even less favourable, with a further reduction of 4%. There is a positive correlation between maize yield and the size of leaf surface area. Maximum leaf surface area and yield of the maize variety "Mv 5" was observed in these experiments when sown at 70 × 50 cm. F. Eng. s. —M.H.

623 Nickerson, N. H. **Sustained treatment with gibberellic acid of five different kinds of maize.** *Ann. Mo. bot. Gdn* 1959, **46,** No. 1–2, 19–37, bibl. 38, illus.

Maize of the well-defined races Parker's (Northern) Flint and Zapalote Chico, the inbred varieties Wisconsin CC5 and L317 and the hybrid variety Spancross were grown in the field and treated with (a) distilled water, or aqueous solutions containing (b) 5 ppm, (c) 25 ppm, (d) 125 ppm or (e) 625 ppm GA. Every 3 days throughout the growing season 1 ml of the appropriate solution was applied to the apical leaf cavity of each plant. Increases in plant height resulting from the GA treatments did not occur in the same nodes in different varieties of maize, or to the same extent for particular nodes in plants of the same variety receiving different levels of GA. GA affected inbred varieties to the greatest extent. Applications of GA reduced branching of tassels and increased the number of nodes forming brace roots. High concentrations of GA inhibited vegetative growth and eventually killed some plants. Some treated plants of all varieties developed tassels exhibiting male sterility and containing some pistillate florets. In Spancross given 125 ppm GA the tassels had a jointed rachis and bore paired pistillate spikelets below and staminate spikelets above.—R.B.

624 Yuan, T.-L. and Sayre, J. D. **The accumulation and distribution of $P^{32}$ in various tissues of nitrogen-, potassium-, calcium-, and magnesium-deficient corn plants.** *Ohio. J. Sci.* 1959, **59,** No. 5, 263–8, bibl. 6. [Ohio Agric. Exp. Sta., Columbus]

Ohio W64 maize grown in gravel cultures was given rain-water for 2 weeks, normal culture solution for 3 weeks, and normal culture solution or

solution deficient in either nitrate-N, ammonium-N, K, Ca or Mg for 4 weeks. During the 2 weeks before harvesting, the phosphate in the culture solution was labelled with $^{32}P$. In plants given normal culture solution, 40% of the total $^{32}P$ in the parts of the plants above ground accumulated in the leaves, 20% in the internodes, 17% in the sheaths, 13% in the tassels, 7% in the nodes and 3% in the buds. Deficiency of nitrate-N caused decreases in total absorption of $^{32}P$ and in the proportion of $^{32}P$ present in the leaves, and increased the proportion of $^{32}P$ in the nodes and internodes. The accumulation of $^{32}P$ in the leaves increased, and that in tassels, buds and sheaths decreased, where ammonium-N, Ca or Mg were deficient. K-deficient plants contained much more $^{32}P$ in leaves, more $^{32}P$ in tassels, and less $^{32}P$ in buds, sheaths and internodes than did normal plants.—R.B.

625 Naryanan, T. R. and Vasudevan, V. **Studies on foliar nutrition of crops : 3. Ragi and maize.** *Madras agric. J.* 1959, **46**, No. 6, 223–9, bibl. 29. [Coimbatore Res. Inst., Madras, India]

In these pot- and field-experiments, nutrients in 0·5% solution were sprayed on to maize (*Zea mays*) and ragi (*Eleusine coracana*), the spray volume being 100 gal/acre. Urea, $(NH_4)_2SO_4$ and $K_2SO_4$ increased the ear weight of maize by >30%, superphosphate increased it by 18%. One spraying of urea increased the grain and straw yield of ragi respectively by 5·3 and 9·9% ; 2 sprayings (at a fortnight's interval) gave increases of 8·2 and 11·2% of grain and straw, respectively. Of the nutrients tested, urea was the most consistently satisfactory.—D.B.

626 Lanza, F. La nutrizione minerale del mais. 3. Effetti della letamazione e della concimazione azotata sulla resa e sul contenuto proteico della granella. [**The mineral nutrition of maize. 3. Effects of farmyard manure and N on yield and protein content of the grain.**] *Maydica* 1959, **4**, No. 3, 67–81, bibl. 19, English and German summaries. [Sta. Sper. Maiscolt., Bergamo, Italy]

In trials in 1958 with the maize hybrid Wisconsin 641 AA, the application of increasing amounts of N up to 200 kg/ha increased the yield and the protein content of the grain. Yields were generally not affected by the time N was applied (either at sowing or as top dressing) provided it was applied before the formation of the 15th leaf ; yields were reduced if the N was applied later. The application of farmyard manure was effective in some cases. [See also *Fld Crop Abstr.* 12 : 97.]—E.B.O.

627 Reynolds, E. B. and others. **Legumes for soil improvement for cotton and corn.** *Bull. 901 Texas Agric. Exp. Sta.* 1958, pp. 14, bibl. 7.

A soil-improvement research programme was carried out from 1949–55 at 2 locations near College Station and 1 at Denton. Shortage of soil moisture was aggravated by growing green manures at 2 locations, and yields of cotton and maize were only slightly improved or were reduced. On bottom-land near College Station, green manuring increased maize yields by 24–86%, but the same result was achieved much more simply by supplying fertilizer nitrogen at 60 lb./ac.—J.D.J.

628 Graham, W. M. **Fumigation of maize in a large shell-concrete building.** *J. Sci. Fd Agric.* 1959, **10**, No. 9, 478–83, bibl. 2. [Nairobi, Kenya]

Filling a Ctesiphon-type store containing maize with methyl bromide gas was found to be more efficient and economic than fumigating under gas-proof sheeting. When used at 2 lb. methyl bromide/1000 cu.ft of maize in stacks + 8 oz./1000 cu.ft of free space, perfect diffusion of the gas was obtained without the use of circulating machinery. In this way cross-infestation by *Tribolium castaneum*, *Ephestia cautella*, *Oryzaephilus surinamensis* and *Calandra oryzae* was eliminated.—S.M.J.

629 Barnes, D. and others. Almacenaje de maíz en el trópico con y sin control de humedad. [**Storage of maize in the tropics with or without control of moisture.**] *Agricultura téc., Méx.* 1958–9, No. 7, 15 and 43–5, illus. [Cent. Invest. Agríc., Cotaxtla, Veracruz, Mexico]

Preliminary results are given from a trial in which seed of the maize var. H-503 was stored under various conditions. Maize seed of 12% moisture content when stored in paper bags in a room where the relative humidity of the air was maintained at about 50%, had a germinating capacity of 85% or more after 16 months.—E.B.O.

630 McCain, F. S. and Schultz, E. F. **A method for determining areas for corn varietal recommendations.** *Agron. J.* 1959, **51**, No. 8, 476–8. [Alabama Agric. Exp. Sta., Auburn]

A study was made of maize yields from varietal trials over a 6-yr period at 15 locations in Alabama, in order to determine whether the 3 areas into which Alabama is arbitrarily divided for the purpose of varietal recommendations have any real validity. North and South were found to be homogeneous regions, but Central is heterogeneous and requires further subdivision.—J.D.J.

## SWEET-CORN

631 Dessiatoff, M. Nouvelles observations sur la culture du maïs sucré. [**New observa-**

**tions on sweet-corn cultivation.**] *C.R. Acad. Agric. Fr.* 1959, **45**, No. 10, 519–22.

The results from many years of trials with sweet-corn in Eure-et-Loir, France, indicated that : (a) in the region of the trials where the average temperature during 1 May–30 Sept. is 16·5°–17°C, the best emergence is obtained by sowing germinated seeds (if a seed-drill is used, imbibed seeds are sown ; in the case of hand-sowing, seedlings with roots 2–3 cm long can be sown) ; (b) the heaviest ears (450 g on average) are obtained by sowing in " pockets of 4 plants " according to the following spacing which gives 29,000 plants/ha : twin rows 35 cm apart and 90 cm between pairs of rows, the plants being 40 and 70 cm apart, alternatively, in the row ; 2 seeds are placed in every hole but the crop is thinned to 1 plant per hole; (c) Mammoth is the best variety. Information is also given on soil cultivation.—E.B.O.

632 Nonnecke, I. L. **The precision of field experiments with vegetable crops as influenced by plot and block size and shape. 1. Sweet corn.** *Canad. J. Pl. Sci.* 1959, **39**, No. 4, 443–57, bibl. 11. [Can. Agric. Res. Sta., Lethbridge, Alberta]

The effect of varying plot and block sizes and shapes on the variability of yields of marketable ears of irrigated hybrid sweet-corn was investigated at 3 locations, using basic plot units of 10 ft × 3 ft. Coefficients of variation decreased with increased plot size. For blocks 1 plot long and 6 plots wide, or 3 plots long and 2 plots wide, widening the plots was more effective in reducing variation than lengthening them, while for blocks 6 plots long and 1 plot wide, or 2 plots long and 3 plots wide, lengthening the plots was more effective. The optimum size of plots for yield and quality studies was either 10 ft × 6 ft or 20 ft × 3 ft, depending upon cost factors and the value of the regression coefficient F. s.—R.B.

## SORGHUMS AND OTHER MILLETS

*See also Abs. 618, 625, 902, 912, 919.*

633 Pickett, R. C. and Fredericks, E. E. **The new look in sorghum.** *Report* 1959, **2**, No. 3, 5–8, illus. [Purdue Univ. Agric. Exp. Sta., Lafayette, Indiana]

Trials with grain sorghum at several locations in Indiana showed that very high yields, up to 246 bu./ac., could be obtained where the crop was grown in 7-in. rows at up to 360,000 plants/ac., and 150–161 bu./ac. in 40-in. weeded rows at 120,000 plants/ac. High levels of N hastened maturation in addition to increasing yields. Fungicide-treated seed germinated and grew normally after 10 days' immersion in water. Where the crop was flooded, growth continued except where the plants were completely submerged. Grain sorghum survived 2 weeks of complete submersion, while maize died after 3–4 days.—R.B.

634 Balasubramanian, C. **Crop weather relationship in rainfed sorghum.** *Indian J. Agron.* 1959, **3**, No. 4, 247–51. [Coimbatore, India]

During the period 1948–56, data were collected on the growth of *Sorghum durra* and *S. roxburghii* during various growth stages from sowing (July to Sept.) to harvest and were correlated with meteorological data. The information showed that the optimum rainfall pattern for sorghum was one which provided 1 in. rain immediately after sowing, 10 in. during growth, and at least 1–2 in. during maturation. Heavy rainfall during flowering interfered with seed setting. The ripening period should extend over 45–50 days.—D.B.

635† Lawton, K. and Bravo, A. R. Sorgo y Sudan, buenos pastos de corte. [**Sorghum and Sudan grass, good fodders for cutting.**] *Bol. Ext. 4 Fac. Agron. Palmira, Colombia* 1959, pp. 15, bibl. 1, illus.

Information is given on the growing of sorghum (*Sorghum vulgare*) and Sudan grass (*S. sudanense*), which are important fodder crops in some regions of Colombia at altitudes less than 1000 m a.s.l. In trials in the Cauca Valley the yields of dry matter obtained from these crops ranged from 2000 to 4700 kg per plaza [1 plaza = 6400 sq. m] per cut (1 or 2 cuts) without irrigation. Sorghum and Sudan grass should be cut from the time earing has begun until it is completed. Average protein contents on a dry matter basis were : sorghum Black Amber 11·3%, sorghum Honey Cane 9·5% and Sudan grass California Common 11·7%.—E.B.O.

636 Idia. Sorgos granîferos y forrajeros. [**Sorghums for grain and fodder.**] *Idia* 1959, No. 134, 1–31, illus. [Esta. Exp. Manfredi, Argentina]

Information is given on various types of sorghum grown in Argentina, particularly their distribution, crop areas, yields, varieties and uses. Problems and research connected with their cultivation are discussed. Sorghum for grain, a relatively new crop in Argentina, was grown on 250,000 ha in 1956–7, Early Kalo from the USA being the variety almost exclusively sown. More than one million hectares were sown in 1956–7 with sorghums for fodder, including sugar-sorghum, Sudan grass (*Sorghum sudanense*) and black sorghum (*S. almum*), 84% of this area being exclusively used for grazing and the remainder for both grazing and seed production. The area under black sorghum has increased considerably during the past few years and 405,700 ha were grown in 1956–7. Broom sorghum is grown on about 30,000 ha.—E.B.O.

637 Tarr, S. A. J. **Crop protection by seed treatment. 2. Seed dressing for sorghum.** *World crops* 1959, **11**, No. 12, 442, bibl. 1, illus.

Fungicidal seed treatments [not specified] improved emergence and stands of *Sorghum vulgare* in the Gezira, the effect being greatest under suboptimum soil and climatic conditions [see *Fld Crop Abstr.* 8 : 846]. Incorporation of 20–40% γ-BHC in the seed-dressing improved yields by a further 20–50%. Use of a powder-dressing containing 25% thiram and 20% γ-BHC, applied at about 1 : 450 by weight of seed, is recommended.—A.M.H.

638 Farrar, L. L. **Control of covered kernel smut (*Sphacelotheca sorghi*) of grain [sorghum] and black loose smut (*Ustilago avenae*) of oats with gibberellic acid in greenhouse studies.** *Pl. Dis. Reptr* 1958, **42**, No. 11, 1254–61, bibl. 33, illus. [Georgia Agric. Exp. Sta., Experiment, Georgia]

In sorghum and oats sprayed at the 3-leaf stage, and oats treated as seed, with 1000 ppm GA, germination was hastened, early growth of the plant was much more rapid, and infection was almost completely prevented. It is suggested that (a) the increase in germination rate in treated seed gives less time for mycelial infection, and (b) by stimulating plant growth the plant is able to outgrow the fungus.—J.D.J.

639 Williams, C. N. **Resistance of *Sorghum* to witchweed.** *Nature, Lond.* 1959, **184**, No. 4697, 1511–12, bibl. 3. [Univ. Coll, Ibadan, Nigeria]

Strains of *Sorghum vulgare* resistant to the root parasite *Striga lutea* are characterized by lack of a substance (excreted from the host-plant roots) which stimulates germination of the parasite seed. The author's tests indicate that resistance is due to the interaction of an inhibitor with the stimulatory substance, the inhibition being possibly a proteinaceous compound similar to that recorded for hulls of *Avena sativa* [*Fld Crop Abstr.* 6 : 891]. This type of resistance differs from that in other sorghums bred in S. Africa, in which mechanical and physiological obstruction in the host is the cause of reduced *Striga* attack. (See investigations noted in *Herb. Abstr.* 14: 7.)—M.H.

640 Portères, R. Les appellations des céréales en Afrique. 7. Les sorghos. [**The names given to cereals in Africa. 7. Sorghums.**] *J. Agric. trop. et Bot. appl.* 1958, **5**, No. 11, 732–61 and 1959, **6**, No. 1–3, 68–84. [See also *Fld Crop Abstr.* 12 : 1220.]

641 Niqueux. Les sorghos d'hivernage au Tchad : variétés, répartition, amélioration. [**Varieties, distribution and improvement of sorghums grown during the wet season in the Chad (French Equatorial Africa).**] *Riz et Rizicult.* 1959, **5**, No. 2–3, 80–93, illus., English and Spanish summaries.

Botanical descriptions are given of the sorghums grown for grain during the wet season in the Chad ; they belong to the species : *Sorghum guineense*, *S. membranaceum*, *S. elegans*, *S. notabile*, *S. caudatum* and *S. durra*. Early varieties of *S. caudatum* are grown near huts. Among late varieties, those of *S. elegans* are predominant in the south, those of *S. guineense* in the lake district, and those of *S. caudatum* elsewhere. The improvement work has been concerned mainly with *S. elegans* and *S. membranaceum*.—E.B.O.

642† John-Shang, K. **Developmental morphology of the inflorescence of *Sorghum vulgare* Pers.** [Chinese] *Acta bot. sinica* 1959, **8**, No. 3, 215–20, bibl. 15, illus., English summary. [Inst. Bot., Academia Sinica]

643 Withee, L. V. and Carlson, C. W. **Foliar and soil applications of iron compounds to control iron chlorosis of grain sorghum.** *Agron. J.* 1959, **51**, No. 8, 474–6, bibl. 10, illus. [Kansas Agric. Exp. Sta., Garden City]

Grain sorghum grown mainly under irrigation on the calcareous loams of the Southern Great Plains often develops Fe-deficiency chlorosis and suffers in yield. Fe compounds broadcast and disced into the seedbed had some beneficial effect, but were economically impractical. Three foliar sprays of 4% $FeSO_4$ at 30 gal. [US]/ac. increased yields approximately fourfold. $FeSO_4$ was cheapest and most effective for this purpose.—J.D.J.

644 Keogh, J. and Maples, R. **Fertilizing grain sorghum.** *Ark. Fm Res.* 1959, **8**, No. 2, 5, illus.

Grain sorghum grown at 4 locations was given 0, 30, 60, 90 or 120 lb. N and 40 or 60 lb. P or K/ac. N at 60 lb./ac. significantly increased grain yields where the soil contained 1% or less organic matter. P and K increased yields at one location where irrigation was employed.—R.B.

645 Ragland, J. L. and Coleman, N. T. **The effect of soil solution aluminum and calcium on root growth [of grain sorghum].** *Proc. Soil Sci. Soc. Amer.* 1959, **23**, No. 5, 355–7, bibl. 10. [N. Carolina Agric. Exp. Sta., Raleigh]

646 Institut National pour l'Étude Agronomique du Congo Belge. [***Eleusine coracana.***] *Rep. INÉAC 1958*, 1959, 451, 468 and 497.

In the Ituri, *Eleusine coracana* sown at 20, 30, 40, 50 and 60 kg/ha yielded 2521, 2663, 2941, 3083 and 3167 kg grain/ha, respectively. At Mont

Hawa, *E. coracana* var. Locale and 0309 of Nioka yielded best (1869 and 1801 kg dry grain/ha, respectively). At Kisozi, the variety BK 35-1 yielded 3230 kg dry grain/ha, and the variety I.M. yielded 894 kg dry grain/ha on marshy soil.—E.B.O.

647† Italia Agricola. Varietà di miglio ibrido, foraggera per le zone aride. [**A variety of hybrid millet, a fodder crop for arid regions.**] *Ital. agric.* 1959, **96**, No. 11, 965–6, illus.

Information is given on the hybrid Gahi-1 (*Pennisetum glaucum*), bred in the USA, which yields from 2 cuts, more than 45,000 kg/ha of fodder for silage.—E.B.O.

648 Portères, R. Les appellations des céréales en Afrique. 10. Les mils à chandelle ou mils pénicillaires (*Pennisetum typhoideum*). 11. Le millet acha. 12. Les millets digitaires (*Digitaria* div. sp.). 13. Les céréales de cueillette et de ramassage. [**The names given to cereals in Africa. 10. Pearl millet (*P. typhoideum*). 11. The millet "acha". 12. *Digitaria* spp. 13. Wild cereals.**] *J. Agric. trop. et Bot. appl.* 1959, **6**, No. 6–7, 290–334, bibl. 304.

## RICE

*See also Abs. 602, 704, 826, 1027.*

649 Deret, J. Considérations sur la riziculture au Soudan (Mali). [**Considerations on rice cultivation in the French Sudan (Mali).**] *Riz et Rizicult.* 1959, **5**, No. 2–3, 121–35, bibl. 14, illus., English and Spanish summaries.

650 Angladette, A. Notes sur la riziculture japonaise. [**Notes on rice-growing in Japan.**] *Riz et Rizicult.* 1959, **5**, No. 4, 161–87, bibl. 108, illus., English and Spanish summaries.

651 Bulletin de Madagascar. Le riz à Majunga. [**Rice at Majunga (Madagascar).**] *Bull. Madagascar* 1959, **9**, No. 161, 912–14.

652 Bulletin de Madagascar. Les pépinières de riz. [**Rice nurseries.**] *Bull. Madagascar* 1959, **9**, No. 156, 449–54.

Information is given on rice nurseries in Madagascar. In the coastal region, 3 ares of nursery and a maximum of 25 kg of seed are required to provide enough plants to transplant 1 ha. The rice plants are left for 30–40 days in the nurseries where they are irrigated with 3000–5000 $m^3$ water/ha.—E.B.O.

653 Department of Agriculture, Western Australia. **Kimberley Research Station.** *Rep. Dep. Agric. W. Aust.* 1958, 24–5 [Received Dec., 1959]

Preliminary studies indicated no increase in rice yield from deep ripping as against shallow ploughing, maintaining a depth of 6 in. of water instead of 3 in., or draining the bay for a period during the vegetative stage. Sowing germinated seed in deep or shallow water in Nov.-Dec. failed to give a satisfactory stand, but sowing in mud was successful.—A.M.H.

654 Oikawa, K. **Studies on the ridge culture of rice plant.** [Japanese] *J. Fac. Agric. Iwate* 1959, **4**, No. 2, 171–3, bibl. 1, English summary.

Ridge-culture of rice in cold regions was investigated. Compared with avenue planting and rectangular planting, rice grown on ridges produced shorter stalks, slightly more ears and a higher effective tiller ratio. Yields were higher from a 3-ft than a 2·4-ft [wide] ridge ; and in a 3-ft ridge, yields were greater with 3 rows than with 2 rows per ridge. A planting density of 90 plants per tsubo gave a higher yield than 75. [1 tsubo = 3·3 $m^2$]. F. Eng. s.—D.B.

655 Hayashi, M. and others. **Ecological studies of rice plants grown early or late in the season. 3 and 4. On the growth of early planted rice plants at several localities in Chiba Prefecture.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1959, **27**, No. 2, 435–7, bibl. 8, English summary. [Chiba Agric. Exp. Sta.]

Early planting of rice increased the number of stalks and panicles, the quantity of starch in the base of the shoot and the percentage of dry matter. The effect of early planting was slight on well drained fields but pronounced on poorly drained soils, especially if these were of clay, volcanic ash, or sand. F. Eng. s.—D.B.

656 Sawa, M. **The effects of early-time sowing and low-temperature treatment of seeds on the growth of upland rice plants.** [Japanese] *J. Fac. Agric. Iwate* 1959, **4**, No. 2, 227–37, bibl. 19, English summary.

Compared with sowing at the normal time (15 April), seeds of upland rice sown early (25 March) germinated more slowly and produced less vigorous plants with a lower grain-producing capacity. When a 30-day low-temperature treatment (22 Feb.-24 March under outdoor temperature) preceded early sowing, heading was hastened and ear weight increased compared with normal sowing date or early sowing without cold treatment. F. Eng. s.—D.B.

657 Kanda, M. and Kakizaki, Y. **Studies on the spacing density of rice plant. 2. Interrelationships between the spacing density and the mode of hill arrangement.** *Sci. Reps Res. Inst. Tohoku D* 1959, **10**, No. 1, 35–59,

bibl. 3. [Kashimadai Exp. Farm, Inst. Agric. Res., Tohoku Univ., Sendai, Japan]

The work described in *Fld Crop Abstr.* 11 : 115 was extended to study the effect on plant height, tillering and yield of different types of hill arrangement (illustrated diagrammatically) based on 4 plants per hill. The density of planting varied between 16 and 1600 seedlings per tsubo [1 tsubo = 3·3 m²].—D.B.

658 Oikawa, K. and Honjyo, K. **On the relation between planting type and spacing width under various weather conditions.** [Japanese] *J. Fac. Agric. Iwate* 1959, **4**, No. 2, 174–81, bibl. 3, English summary.

Under similar spacing densities, square planting of rice gave more tillers than avenue planting. The 'avenue' type, however, is more reliable because of its smaller yield-deviation in bad years. In unfavourable weather, the closer the spacing, the better the crop. In favourable weather about 80 plants [per tsubo] is a suitable density. [1 tsubo = 3·3 m²]. F. Eng. s.—D.B.

659 Chang, H. S. **Production, certification and distribution of Ponlai rice seeds in Taiwan.** *Internat. Rice Comm. News Lett.* 1959, **8**, No. 2, 8–16. [Chin.-Amer. Joint Comm. Rur. Recontr., Taipei, Taiwan]

The certification of Ponlai rice (*japonica* type) seed in Taiwan was started in 1957. Field inspection and storage inspection are carried out on all 3 levels (foundation, stock and extension) of seed farms. Laboratory analysis is conducted on all foundation and stock seeds but only on one-third of the seeds for extension. The certification work may be expanded in future to cover all extension seed farms. Information is given on containers used for storing rice (foundation and stock seeds are sun-dried to 13% moisture) and on the distribution of pure seed.—E.B.O.

660 Piacco, R. Una nuova varietà di riso : Precoce Monticelli. [**Early Monticelli, a new rice variety.**] *Riso* 1959, **8**, No. 10, 11–12, illus.

A description is given of the new rice variety Early Monticelli, which has a growing period of 154 days and is resistant to lodging and disease. The mature plants are 116 cm high.—E.B.O.

661 Dewez, J. and Catzeflis, J. Le riz dans la vallée de la Ruzizi. [**Rice in the Ruzizi valley (Belgian Congo).**] *Bull. Inform. I.N.É.A.C.* 1959, **8**, No. 6, 341–54. [Sta. Essais, Lubarika]

The characteristics are given of 7 local varieties of rice grown in the Ruzizi valley. The improved variety L 7 is being multiplied on farms. Information is given on the sowing, irrigation, harvesting, green manuring and chemical manuring of rice.—E.B.O.

662 Institut National pour l'Étude Agronomique du Congo Belge. [**Rice.**] *Rep. INÉAC 1958*, 1959, 83, 252, 330, 378 and 468.

The rice variety R 66 is being multiplied for distribution mainly in the central forest region. At Likimi R 66 and R 75 yielded best (about 3 metric tons dry grain/ha). At Mont Hawa Experimental Station, the best sowing date for rice was mid-May.—E.B.O.

663 Dufournet, R. and Dobelmann, J. P. Les principales variétés de riz sélectionnées à Madagascar. [**The principal rice varieties selected in Madagascar.**] *Riz et Rizicult.* 1959, **5**, No. 2–3, 73–9, illus., English and Spanish summaries.

The characteristics are given of 16 rice varieties, of which 10 were selected at Lake Alaotra Station and 6 at Marovoay Agricultural Station. Some of them are high-quality varieties for export, others are high-yielding, hardy varieties for local consumption, while Makalioka 34, Makalioka 823 and Vary lava 16 are suitable for both purposes.—E.B.O.

664 Kai-Chü, Y. and others. **Studies on the selection of some "second seasoned rice" varieties for two crops of rice annually with their sowing dates and seedling ages.** [Chinese] *Acta Agric. sinica* 1959, **10**, No. 4, 221–55, English summary.

Rice varieties suitable for second-season cultivation in W. and N. regions of Szechwan were the medium-maturing varieties of the Kengtao type which give consistently good yields. Since second-season rice must be transplanted during the latter half of July, medium-maturing varieties (transplanted when 30–40 days old) must be sown from mid- to late-June. To attain 70% seed set the mean daily temperature should be above 23°C at full heading time. In W. and N. Szechwan this condition is satisfied in late August or early September. F. Eng. s.—D.B.

665 Chang, H. S. **Production, certification and distribution of Ponlai rice seeds in Taiwan.** *Internat. Rice Comm. News Lett.* 1959, **8**, No. 2, 8–16. [Chin.-Amer. Joint Comm. Rur. Reconstr., Taipei, Taiwan]

Ponlai rice is a common name for the improved varieties of the *japonica* type, including both the varieties introduced from Japan, and those obtained by intercrossing these Japanese varieties or by crossing them with the native rice in Taiwan. Ponlai rice has a stiff straw and a short, round grain, and is insensitive to day-length, is early-maturing and a high yielder ; it is recommended in lieu of the native rice.—E.B.O.

666 Vasconcellos, J. C. Evolução da vegetação infestante dos arrozais no concelho da

Azambuja. [**Evolution of weeds of rice-fields in the municipality of Azambuja (Portugal).**] 1959, pp. 56, bibl. 17, illus., English summary, Lisboa : Minist. Econ., Com. Reg. Comércio Arroz.

The results are given from botanical surveys, carried out in the rice-fields of Azambuja on 15 Apr., 2 and 16 May, 18 June, 1 and 19 Aug. and 9 Sept., to study the evolution of weeds (vascular plants and algae) during the growth of rice. [See also *Fld Crop Abstr.* 11 : 563.]—E.B.O.

667 CHATEAU, R. Recherche sur l'influence de l'époque d'application du 2,4-D sur différentes variétés de riz à Richard-Toll (Sénégal). [**Investigation into the influence of the date of applying 2,4-D on different rice varieties at Richard-Toll (Senegal).**] *Riz et Rizicult.* 1959, **5**, No. 2–3, 117–19, English and Spanish summaries.

In trials in 1957–8, a preparation containing 310 g of 2,4-D (in the form of alkylcyclohexanol ester) per l was sprayed on 4 rice varieties at the rate of 2 l in 100 l of water per ha. Five dates of application were tested. In both years, about 1 month after flooding, the experimental plots were infested by *Sphenoclea ceylanica* and, in 1958, also by *Fuirena glomerata* ; *Cyperus iria* and *Echinochloa colonum* were also present. Treatment with 2,4-D applied between the 30th and the 50th day after emergence gave the best control of weeds, particularly *S. ceylanica*, and did not cause any abnormalities to the rice plants.—E.B.O.

668 VEGA, M. R. and LLENA, P. A. **The effect of some newer herbicides as pre-emergence spray.** *Philipp. Agriculturist* 1959, **43**, No. 4, 250–9. [Cent. Exp. Sta., Univ. Philippines, Laguna]

Of 5 herbicides tested as pre-emergence sprays on upland rice, neburon at 4·5 kg/ha was the most effective against broad-leaved weeds and grasses. The diethanolamine salt of 2,4-DP at 2·3 kg/ha considerably delayed weed germination.—R.B.

669 BOWLING, C. C. **A comparison of three methods of insecticide application for control of the rice water weevil.** *J. econ. Ent.* 1959, **52**, No. 4, 767, bibl. 2. [Texas Agric. Exp. Sta., Beaumont]

Century Patna 231 rice was fertilized with 60 lb. N/ac. and 40 lb. $P_2O_5$/ac. 3 weeks after sowing. Aldrin at 8 oz./ac. was applied (a) as a seed treatment, (b) as a spray at the time of fertilizer application, (c) in the form of granules or wettable powder, mixed with the fertilizer. The plots were flooded immediately after manuring, and remained flooded until harvest. All insecticidal treatments effectively controlled rice water weevils (*Lissorhoptrus oryzophilus*) and significantly increased yields of grain.—R.B

670 FERNANDO, H. E. **The susceptibility of the rice pentatomid bug, *Scotinophara lurida* (Burm.), to insecticides, and the insecticidal control of this pest in Ceylon.** *Bull. ent. Res.* 1960, **50**, No. 4, 717–35, bibl. 7. [Dep. Agric., Peradeniya, Ceylon]

*S. lurida* is a serious pest of rice in certain areas of Ceylon. In field trials parathion, applied at a concentration of 0·02% active ingredient, was the most effective of the insecticides tested as it gave 100% control of the pest within 24 hr. Chlorthion, dipterex and endrin gave 95–100% control.—E.B.O.

671 NICHOLS, C. W. and WILKEY, R. F. **Hoja blanca (white leaf), a destructive virus disease of rice.** *Bull. Dep. Agric. Calif.* 1959, **48**, No. 1, 32–6, bibl. 17, illus.

This is a review article.—R.B.

672 JOHNSTON, T. H. and others. **Straighthead and rice varieties in Arkansas.** *Ark. Fm Res.* 1959, **8**, No. 2, 2, illus.

Straighthead developed at 2 locations where 14 rice varieties were being grown. Of 3 short-grain varieties sown, Cody was least susceptible. Nato and C.I. 9407 (Lacrosse × Arkrose) were the least susceptible medium-grain varieties, but Arkrose gave the highest yields of grain. Bluebonnet 50 was the least susceptible long-grain variety, Sunbonnet the most susceptible. To prevent straighthead, it was recommended that fields should be drained so that they dry out just before the plants reach the jointing stage, namely 7–8 weeks after sowing for varieties maturing at the same time as Zenith and Nato, and 8–9 weeks after sowing for those maturing at the same time as Bluebonnet 50.—R.B.

673 PORTÈRES, R. Les appellations des céréales en Afrique. 9. Les riz. [**The names given to cereals in Africa. 9. Rice.**] *J. Agric. trop. et Bot. appl.* 1959, **6**, No. 4–5, 189–233.

[See also Abs. 615.]

674 OKA, H. I. and CHANG, W. T. **The impact of cultivation on populations of wild rice, *Oryza sativa* f. *spontanea*.** *Phyton* 1959, **13**, No. 2, 105–17, bibl. 10, illus.

The following rice populations growing in Raipur district, Madhya Pradesh, India, were studied : (a) *Oryza sativa* f. *spontanea* from a swampy grassland ; (b) the same species, type similar to *spontanea*, from a grass strip between rice-fields ; (c) *O. sativa* f. *spontanea* as a weed in rice-fields ; (d) a cultivated variety of the indica type from the same field as (c) ; (e) *O. perennis* from a water reservoir. The seeds from these populations, on an individual plant basis, were sown in a " plant-to-row " experiment at Taichung, Formosa. The examination of the plants obtained showed a gradation from truly wild (a) to cultivated (d)

forms, while *O. perennis* was outside the range. The percentage of out-crossing was 20–30% in (a), 10–20% in (b) and (c), and less than 10% in (d). As to seed dormancy, populations (b) and (c) were intermediate between the truly wild (long dormancy) and the cultivated form (short dormancy). —E.B.O.

675 Nagato, K. and Kobayashi, Y. **On varietal differences in the tissue of starch-cell of rice kernels.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1959, **27**, No. 4, 443–5, bibl. 4, illus., English summary. [Nagoya Univ.]

An illustrated account is given of the deposition of starch in the starch grains of several varieties of rice. Three types of deposition are recognized. F. Eng. s.—D.B.

676 Tang, P. S. and others. **Studies on plant respiration. 3. Influence of oxygen tension on organ formation, material and energy transformation during germination of rice seeds.** [Chinese] *Acta bot. sinica* 1959, **8**, No. 3, 188–200, bibl. 19, English summary. [Peking Inst. Pl. Physiol., Academia Sinica]

As the oxygen content of air was reduced from 21 to 2%, the root/top ratio of Yinfang, a lowland variety of rice, fell from 1 : 1 to 1 : 3, elongation of the coleoptile (elongation of existing cells) increased, and the rate of loss in weight of endosperm (a measure of transference of food reserves to the seedling) was greatly reduced. At 0·2%, which is approximately the partial pressure of oxygen surrounding seedlings in a flooded seed-bed, the rate of loss in weight of endosperm was about one-eighth the rate of loss in air. See also *Fld Crop Abstr.* 11 : 1035, 12 : 687, 13 : 677. F. Eng. s.—D.B.

677 Chu, C. and Tang, P. S. **Studies on plant respiration. 4. Some morphological, physiological and biochemical changes during germination of rice at different partial pressures of oxygen.** [Chinese] *Acta bot. sinica* 1959, **8**, No. 3, 201–14, bibl. 28, illus., English summary. [Peking Univ. and Peking Inst. Pl. Physiol., Academia Sinica]

An account is given of the germination of a lowland variety of rice (Yinfang) under different oxygen pressures. Some practical results of the findings are suggested. These authors do not limit the concept of germination to elongation (of coleoptile, coleorhiza and primary root), a stage in which cell division does not occur and oxygen is not necessary ; they also include the formation of new tissues and organs and the transference of food reserves from the endosperm, both processes which require oxygen. Their findings indicate that irrigation should allow for maximum aeration, flooding should be avoided except for temperature regulation and for maintenance of correct moisture supply for seedlings. Seedling damage which results from excessive flooding includes (a) 'toppling over' caused by excessive growth of coleoptile and upward growth of roots, and (b) susceptibility to infection resulting from lack of food from the endosperm. See also *Fld Crop Abstr.* 11 : 1035, 12 : 687, 13 : 676. F. Eng. s.—D.B.

678 Okajima, H. **On the relationship between the nitrogen deficiency of the rice plant roots and the reduction of the medium.** *Sci. Reps Res. Inst. Tohoku D* 1959, **10**, No. 1, 1–13, bibl. 11, illus.

Water-culture experiments with rice roots demonstrated that a continuous supply of N was necessary at all growth stages to prevent the formation of $H_2S$ in the root medium and root rotting.—D.B.

679 Samoto, K. and others. **Studies on the growth of rice plants cultivated in different seasons. 2. Changes of water and soil temperature and oxidation potentials in paddy fields and root development of rice plants.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1959, **27**, No. 3, 337–40, bibl. 5, English summary. [Tokai-Kinki Nat. Agric. Exp. Sta.]

Roots of rice plants grown early in the year experienced, at early and late growth-stages, lower soil- and water-temperatures than did rice grown at the normal time of year. The rotting of roots was delayed, and the healthy condition of the roots prevented the so called 'autumn decline'. F. Eng. s. —D.B.

680 Ueki, K. **The influence of temperature of irrigation water upon the growth of paddy rice in the warmer district. 4. On the influence of water temperature at tillering period upon the growth of rice.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1959, **27**, No. 4, 426–8, bibl. 12, English summary. [Kagoshima Univ.]

The number of tillers and spikelets per unit area decreased as the temperature of irrigation water rose from 22 to 30°C. The number of grains and weight of grains per unit area were greatest in plots in which the mean water temperature was 25–26°C and the maximum temperature was under 30°C. F. Eng. s.—D.B.

681 Ting, Y. and others. **Observations on the process of development of rudimentary panicle of rice and the maturity of grain.** [Chinese] *Acta Agric. sinica* 1959, **10**, No. 2, 59–85, bibl. 12, illus., English summary. [Agric. Coll. Southern China]

The differentiation and development of panicles, the development of maturing grains and the degeneration of the spikelet were studied in 4 varieties of rice when these had been transplanted

by the local method. The reactions of the varieties to different environmental conditions were also noted. F. Eng. s.—D.B.

682 SMETANIN, A. P. [**Effect of temperature and light intensity on panicle formation in rice** (*Oryza sativa* L.)] [Russian] *Bot. Ž., SSSR* (*Bot. J., USSR*), 1959 **44**, No. 8, 1134–41, bibl. 13. [Krasnodar, USSR]

The description of the development of the growing point of the early-ripening rice variety Dubovskiĭ 129 is based on material grown in culture vessels containing soil taken from a field on which rice had been grown continuously for 17 years. The soil and water temperature ranges studied included 18–20°, 20–27° and 29–35°C. Illumination intensity was reduced to 50 and 30% of full daylight by means of canvas covers. The reaction of the plants at various stages of their development to these factors is recorded.—M.H.

683 JAN HE-FON and ŠA KAN-FA. [**Preliminary studies of lodging in rice.**] [Chinese] *Acta Agric. sinica* 1959, **10**, No. 4, 311–17.

684 AIMI, R. and MURAKAMI, T. **Paper-chromatographic survey of protein and amino acids in rice plant during ripening.** *Proc. Crop Sci. Soc. Japan* 1959, **27**, No. 4, 412–16, bibl. 3, illus., Japanese summary. [Nat. Inst. Agric. Sci.]

Diagrams show the chromatograms of proteins and amino acids in leaf blades and flowers of rice (Norin No. 29) at the following stages : booting, flowering, early milk, late milk, early yellow, yellow, fully ripened ; and in the pericarp, endosperm and embryo of the ripened grain.—D.B.

685 KONNO, S. and AIMI, R. **Behaviour of phosphorus compounds during the ripening of rice plants.** *Proc. Crop Sci. Soc. Japan* 1959, **27**, No. 4, 408–11, bibl. 8, Japanese summary. [Nat. Inst. Agric. Sci.]

The changes in fresh weight, dry weight, amounts of total P, inorganic P, phytin, and sugar-ester P including glucose-1-phosphate, which took place in the stem internodes and ear of rice (var. Norin No. 29) during the ripening period (70 days following flowering) were studied in plants maintained in glasshouses at 17, 21 and 25°C. Graphs demonstrate the results. Considering the whole ripening period, 21°C was the best temperature for increase in fresh weight, dry weight and total P in the ear. These increases were at first most rapid in plants at 25°C but soon ceased and were overtaken by increases in plants at 21°C. In the stem, P was present chiefly as inorganic P. During ripening this was translocated to the ear and converted into phytin. There was a similarity between transference of P and transference of carbohydrates from culm to ear. [See Abs. 686.]—D.B.

686 AIMI, R. and others. **Physiological studies on the mechanism of crop plants. The effect of the temperature upon the behaviour of carbohydrates and some related enzymes during the ripening of rice plant.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1959, **27**, No. 4, 405-7, bibl. 14, English summary. [Nat. Inst. Agric. Sci.]

Rice plants, var. Norin No. 29, which had reached flowering were allowed to ripen in glasshouses at temperatures of 17, 21 and 25°C. They were sampled every 4 days and their content of carbohydrates and related enzymes in the ear and in certain internodes of the stem was determined. Sixty-five days after flowering, dry weight and starch content of the ear were highest in plants ripening at 21°C. Complete ripening was prevented at 17°C by the slow rate of transference of carbohydrates from culm to ear, and at 25°C by the inability of the ear to receive the rapidly translocated supply of carbohydrates. F. Eng. s.—D.B.

687 PELTIER, M. A. G. Note sur la biologie florale du riz cultivé (*Oryza sativa* L.) dans les conditions du Lac Alaotra (Madagascar). [**Note on the flowering of cultivated rice** (*O. sativa*) **under the conditions at Lake Alaotra** (**Madagascar**).] *J. Agric. trop. et Bot. appl.* 1959, **6**, No. 10, 469–81, illus. [Sta. Agron., Lac Alaotra]

From observations made during 1955–8 on many rice varieties, it was concluded that the biology of flowering of rice grown near Lake Alaotra is similar to that described for rice grown in other countries of the world. In particular, flowering of a panicle lasts 5–9 days ; the duration of useful flowering of a plant is generally less than 3 weeks and that of a variety less than 1 month ; the daily period of active flowering is from 9.30 a.m. to 3 p.m. with a peak between 11 and 12 hr., or later when environment conditions are unfavourable.—E.B.O.

688 PEARSON, G. A. **Factors influencing salinity of submerged soils and growth of Caloro rice.** *Soil Sci.* 1959, **87**, No. 4, 198–206, bibl. 14, illus. [U.S. Salinity Lab., Riverside, California]

The results from a glasshouse experiment to study the effect of initial soil salinity, salt content of the irrigation water and rate of drainage on the growth of Caloro rice, indicated that : (a) evapotranspiration was directly proportional to the dry weight of rice (straw plus grain) produced ; (b) seedlings were highly sensitive to salinity in their early stages of growth but were progressively less sensitive when 3 and 6 weeks old ; (c) increasing levels of salinity had an adverse effect on vegetative growth and, more so, on reproduction ; (d) a 50%

decrease in grain yield was associated with an electrical conductivity of the soil solution of 8 mmho. in the active root zone during the growing season. —E.B.O.

689 Misra, G. and Mishra, D. **Comparative effects of potassium and cobalt in an early variety of rice.** *Curr. Sci.* 1959, **28,** No. 6, 257–8, bibl. 4. [Ravenshaw Coll., Cuttack-3, India]

Before sowing, seeds of an early variety of rice were soaked for 48 hr. in one of the following solutions : KCl and $CoCl_2$ each at concentrations of 1, 10, 100 and 1000 ppm. When 3 weeks old, the foliage of some of the plants was sprayed, with a solution corresponding to the one in which the seeds had been soaked, at weekly intervals until ear emergence. Compared with control plants (soaked in distilled water), KCl brought about better vegetative growth and earlier ear emergence (by 1 – 5 days according to concentration of solution), while $CoCl_2$ depressed vegetative growth and delayed ear emergence, significantly at 100 and 1000 ppm. [The difference in behaviour, if any, between the sprayed and unsprayed plants is not recorded.]—D.B.

690 Matsushima, S. and Manaka, T. **Analysis of developmental factors determining yield and its application to yield prediction and culture improvement in lowland rice. 51. Effects of top-dressing with ammonium sulfate on the grain yield and its constitutional factors at critical periods relating to determinination of each yield-constitutional factor.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1959, **27,** No. 4, 432–4, bibl. 6, English summary. [Nat. Inst. Agric. Sci.]

The best stages at which to apply top dressings of $(NH_4)_2SO_4$ for increasing the various plant attributes which contribute to rice yield (yield components) are as follows for : (1) number of panicles per hill, maximum tillering stage; (2) number of spikelets per panicle, differentiation of 1st bract primordium and immediately preceding meiosis of pollen mother cell ; (3) number of spikelets per hill, differentiation of 1st bract primordium ; (4) % ripened grains, immediately following full heading ; (5) weight of 1000 grains, just before meiosis of pollen mother cell. F. Eng. s. —D.B.

691 Abichandani, C. T. and Patnaik, S. **Method and time of nitrogen application to rice.** *Internat. Rice Comm. News Lett.* 1959, **8,** No. 2, 16–19, bibl. 8. [Cent. Rice Res. Inst., Cuttack, India]

For rice under most soil conditions in India, a suitable N application is 40–60 kg/ha. At Cuttack the optimal N level is 40 kg/ha and the *indica* varieties do not respond as well to a high amount of N as the *japonica* varieties do. Under low-land water-logged conditions, N losses can be checked and the efficacy of the fertilizer increased if the fertilizer is placed in the sub-surface zone. By this method yields have been increased by 8–10%, compared with the customary surface application. With a 160-day variety, split application of N, 22 kg at sowing, 11 kg 30 days after sowing and 11 kg 30 days before flowering, per ha, increased the efficacy of the fertilizer considerably and gave a grain yield response of 1021 kg/ha, as compared with 756 kg/ha obtained with a single application of 44 kg N/ha at sowing.—E.B.O.

692 Tanaka, A. and others. **Studies on the nutrition of rice plant (*Oryza sativa* L.). 6. Utilization of ammonium and nitrate nitrogen by rice plant under waterlogged soil state.** *Proc. Indian Acad. Sci.* B 1959, **50,** No. 2, 61–74, bibl. 21. [Central Rice Res. Inst., Cuttack]

The culture solution experiments reported in *Fld Crop Abstr.* 13 : 178, were continued as soil culture experiments. At all stages of plant development, $NH_4$-N was superior to $NO_3$-N, the utilization of N being respectively 55–60% and 5–20%. Split applications of $(NH_4)_2SO_4$, two-thirds at planting and one-third before ear initiation, or at boot stage, gave a greater mean panicle weight than did the full dose at planting.—D.B.

693 ten Have, H. *Crotalaria quinquefolia*, een veelbelovende groenbemester voor de rijstcultuur in Suriname. ***Crotalaria quinquefolia*, a promising green manure for the rice culture in Surinam.** *Surinaam. Landb.* 1959, **7,** No. 2, 39–50, bibl. 4, illus, English summary. [Stichting Machinale Landbouw in Suriname, Paramaribo]

Preliminary trials with *Crotalaria quinquefolia* as a green manure indicate that its use may increase yields of lowland rice by more than 1000 kg/ha and reduce the manurial requirement of the rice crop from 40 kg N/ha to nil. It appears to increase the availability of P. The best time for sowing *C. quinquefolia* is in mid-Nov., shortly before the beginning of the minor rainy season, at a rate of 30 kg seed/ha, though it is possible to sow later. Inoculation with Rhizobia is usually unnecessary. The young seedlings withstand excess moisture well, and grow extremely slowly for about the first 4 weeks, but thereafter quite rapidly. Where an adequate seed rate is employed, the crop effectively smothers weed growth. Ploughing-in for green manure is best done at 15 weeks after sowing, when 20-30 tons of green material/ha have been produced. It is not advisable to plough-in under wet conditions owing to the risk that the green manure will cause the rice crop to lodge as a result of too vigorous growth. *C. quinquefolia* combine-harvested for seed at about 18 weeks after sowing

yields about 800–1000 kg seed/ha. Seed cleaning and drying is necessary. The caterpillars of *Utetheisa ornatrix* cause considerable damage to the crop, consuming both leaves and pods, but can be controlled with endrin or dieldrin at 1·2–2 l a.i./ha or by dusting with BHC.—R.B.

694 Ali, A. M. **How Madras State organised border planting of *Sesbania speciosa*.** *Madras agric. J.* 1959, **46**, No. 6, 217–22.

695 Strong, R. G. and Lindgren, D. L. **Effect of methyl bromide and hydrocyanic acid fumigation on the germination of rice.** *J. Econ. Ent.* 1959, **52**, No. 4, 706–10, bibl. 10. [Univ. California Citrus Exp. Sta., Riverside]

Rice, var. Calrose and Caloro, containing 8, 10, 12 and 14% moisture, was fumigated at 50, 70 and 90°F with HCN or $CH_3Br$. Fumigation with HCN for 72 hr. had no effect on percentage germination. Impairment of germination resulting from treatment with $CH_3Br$ increased with increasing exposure time, rate of application, temperature during fumigation and seed moisture content. $CH_3Br$ had little effect on the rate of germination of seeds surviving fumigation. [See *Fld Crop Abstr.* 12 : 1132]—R.B.

696 Giglioli, E. G. **Mechanised rice production at the Mahaicony-Abary scheme, British Guiana.** *J. agric. Soc. Trin. Tob.* 1959, **59**, Pt 1, 43–75.

The development of the Mahaicony-Abary rice-growing scheme is reviewed.—S.M.J.

## GENERAL

697 Andrews, J. E. and others. **Variation among rows in power-seeded cereal variety trials.** *Canad. J. Pl. Sci.* 1959, **39**, No. 1, 25–9, bibl. 3, illus. [Can. Dep. Agric., Lethbridge, Alberta]

Yields of winter wheat, spring wheat and barley, and winter survival of winter wheat, were consistently greater, owing to soil compaction, where seed was drilled into tyre-marks made by the tractor, than where seed was not so drilled. A seed-drill with 4 driving wheels which compacted the soil directly in front of the drill discs considerably reduced the variation in yield between rows.—R.B.

698 Winkler, H. and Lustig, H. Artförsök med vårsäd utförda vid Statens Försöksgård Flahult åren 1940–1952. **Comparative trials with different species of spring-sown cereals, carried out at the State Agricultural Experiment Farm Flahult in the years 1940-52.** *Medd. 97 Stat. JordbrFörsök, Uppsala* 1959, pp. 18, bibl. 13, English summary.

The results are given of 2 series of trials at the Flahult Experimental Farm, Sweden, one series on a sedge-wood (carr) peat soil and the other on a sphagnum peat soil. In 12 trials on the sedge-wood peat soil, mean grain yields were highest for 6-row barley with 2870 kg/ha, compared with 2150 kg for oats, 1900 kg for spring wheat and 1860 kg for spring rye. On the sphagnum peat soil, mean yields of 6-row barley in 11 trials were 2290 kg/ha, compared with 1980 kg for oats and 1460 kg each for spring wheat and spring rye. In terms of Scandinavian fodder units, 6-row barley outyielded oats by 60 and 39% on the sedge-wood peat and sphagnum peat soils, respectively. The mean crude-protein content of the grain ranged from 16·6% for spring wheat to 13·7% for spring rye on the sedge-wood soil ; on the sphagnum peat soil, values ranged from 13·4% for spring wheat to 10·4% for 6-row barley. No N fertilizers were used in any of these trials. The results showed that the sedge-wood peat soil was very suitable for cereal production. The yield superiority of 6-row barley was due to its early ripening ; in these trials, it ripened an average of 3 weeks earlier than oats. —P.J.B.

699 Ministry of Agriculture, Fisheries and Food. **Choosing selective weedkillers for cereals.** *Adv. Leafl. 315 Min. Agric., Fish., Fd* 1959, pp. 8, London : H.M.S.O.

700 Ministry of Agriculture, Fisheries and Food. **Selective weed control in cereals.** *Adv. Leafl. 436 Min. Agric., Fish., Fd* 1959, pp. 9, London : H.M.S.O.

Recommendations for weed control in cereals are given, and the responses of 38 annual and seedling biennial and perennial weeds to different herbicides are tabulated.—S.M.J.

701 Vidme, T. Forsøk med kjemiske midler mot ugras i kornåker, 1948-56. [**Trials on chemical weed control in cereals, 1948-56.**] *Forskn. Fors. Landbr.* 1959, **10**, No. 2, 127–57. English summary.

The results of 254 experiments in Norway on weed-control in spring-sown cereals during 1947–56 are given.—S.M.J.

702 Priadcenco, A. and others. L'influence de l'irradiation avec des rayons X et des neutrons thermiques sur les graines de céréales et de mais. [**The influence of irradiation with X-rays and thermal neutrons on seeds of cereals and maize.**] *Nuclear Sci. Abstr.* 1959, **13**, No. 8 supplement, 809–10. [Inst. Agric. Res. Romania] [Paper presented at 2nd U.N. Conf. Peaceful Uses of Atomic Energy]

Seeds of several varieties of wheat, oats, barley and maize were given various doses of X-rays and thermal neutrons. Treatment inhibited seed germination. Plants grown from irradiated seed had a slower rate of growth and development, lengthened vegetative cycle, pronounced sterility and greater susceptibility to disease than the controls.—R.B.

703 MÜLLER, F. Über die Herabsetzung der Plasmaviskosität nach Vernalisation und die damit verbundene Verminderung der Kälteresistenz bei Getreide. [**The lowering of plasma viscosity after vernalization with which is associated the lowering of resistance to cold in cereals.**] *Angew. Bot.* 1959, **33**, No. 4, 159–62, bibl. 12. [Inst. PflZücht., Martin-Luther Univ., Halle-Wittenberg, E. Germany]

704 OXLEY, T. A. **Determination of moisture content in cereals. 1. Interaction of type of cereal and oven method.** *J. Sci. Fd Agric.* 1960, **11**, No. 1, 18–25.

The moisture-content values obtained by 5 different oven-drying methods for hard and soft wheats, milled and parboiled rice, dent and flint maize, oats and barley at different moisture levels are given.—S.M.J.

705 KOFOED, P. S. **Investigations on drying grain with slightly pre-heated air in thick layers.** *Årsskr. K. vet. Landbohøjsk.* 1959, 17–49, bibl. 9, illus.

The results are presented of investigations with experimental grain-drying apparatus into the course of drying in thick (up to 2 m) layers of cereal grain, using cold or slightly pre-heated air. The practical applications of the results are discussed.—P.J.B.

706 ZIJDEWIND, C. Graan drogen op de boerderij. [**Drying grain on the farm.**] *LandbVoorl.* 1959, **16**, No. 7, 315–21, illus. [RijkslandbConsulentsch. N. N.-Holland, Schagen]

The advantages and disadvantages of drying grain on the farm, either loose or in sacks, are discussed. The construction and use of horizontal floor-drying installations is described, and figures representative of the cost of using such an installation for drying various quantities of grain with moisture contents ranging from 19 to 31% are quoted.—R.B.

707 SPARENBERG, H. Drogen en opslaan van graan op de boerderij. [**Drying and storage of grain on the farm.**] *LandbMechanisatie* 1959, **10**, No. 8, 436–42, illus. [Inst. Bewar. Verwerk. LandbProd., Wageningen, Netherlands]

Descriptions are given of suitable installations for the drying of moist grain in bulk or in sacks, and suggestions are made for converting potato stores into grain driers. Ventilation of moist grain with unheated air during storage is described. The temperatures, air flow and times required for drying grain are indicated. Tables are given of the maximum lengths of time for which malting barley and other cereals at various moisture contents may be stored without spoilage.—R.B.

708 NETHERLANDS. Nederlands Graan-Centrum. Het graanonderzoek in 1959 in de Benelux. [**Cereal research in the Benelux countries, 1959.**] *Meded. 7 Ned. Graan-Centrum*, 1959, pp. 93, mimeo.

This publication contains a list of the scientific investigations concerned with the breeding, growing and processing of grain in progress in Belgium and the Netherlands. The projects enumerated are grouped under the heads : general and biological research ; genetical and varietal investigations ; diseases and pests ; cultural problems, including manuring ; drying and storage ; handling and processing of grain and straw ; nutritive value.—G.M.R.

## LEGUMES

### SOYABEANS

*See also Abs. 743, 900, 904, 918.*

709 MARTINEZ, S. E. La soya nuevo cultivo para el noroeste. [**Soyabean, a new crop for northwest Mexico.**] *Agricultura téc., Méx.* 1958–9, No. 7, 23 and 35. [Cent. Invest. Agríc. Noroeste, Ciudad Obregón]

710 CAMPER, H. M. and SMITH, T. J. **The effect of date of planting, rate of planting, and width of row on two soybean varieties.** *Res. Rep. 21 Virginia Agric. Exp. Sta.*, 1958, pp. 27, bibl. 11.

Four experiments were conducted at Warsaw, Virginia, in 1951–4, with the soyabean varieties S100 and Ogden. The best seed yields were obtained by sowing in late May or early June. Later sowings required a narrow row width (1 ft) and a high seed rate (7 pecks/ac.), but yields were not as high as those from earlier sowings. Information is also given on stand, height, lodging, seed size and quality, maturation period and seed composition.—J.D.J.

711† EBERTOVÁ, Helena. **Redox potentials in soybean nodules during the vegetative period.** *Nature, Lond.* 1959, **184**, No. 4692, 1046-7, bibl. 7. [Res. Inst. Pl. Prod., Prague, Czechoslovakia]

The course of the *r*H and pH values in soyabean stems, roots and nodules has been followed during the whole vegetative period and related to

the increase in number and size of nodules. The data indicate that nodules on leguminous plants with quickly growing root systems originate on secondarily thickened parts of roots without root hairs and without primary cortex. The appearance of new active nodules is not limited by the advancing age of the host plant, almost until the ripening of the fruits. The *r*H values reflect only the physiological state and age of nodules and are largely independent of the age of the host. The differences between *r*H values in various soyabean organs and in nodules are evidence of specific biochemical processes taking place in the nodules during the fixation of N and show that nodules cannot be regarded as ordinary organs of the plant, as might be deduced from the experiments on rates of respiration of nodules. [See also *Herb. Abstr.* 12 : 759.]—M.H.

712 Hernández-Medina, E. and Lugo-López, M. A. **Observations on the boron-manganese relationships in soybean and corn plants.** *J. Agric. Univ. P.R.* 1958, **42**, No. 1, 27–34, bibl. 6, illus. [Univ. Puerto Rico, Río Piedras]

Soyabeans were grown in sand culture with 0, 0·001, 0·01, 0·25, 2 or 5 ppm Mn and/or 0, 0·005, 0·5, 3 or 5 ppm B, and maize with Mn and/or B at 0, 0·01, 0·25, 2 or 5 ppm. Mn at 5 ppm was toxic to soyabeans and reduced yields, but symptoms were alleviated by B at concentrations up to 0·5 ppm. Above this level B was itself toxic. There were no definite symptoms of Mn toxicity in maize, but Mn accumulation in the leaves was restrained by increasing concentrations of B. Maize yields were reduced by B at 2 or 5 ppm. —J.D.J.

713 van Schaik, P. H. and Probst, A. H. **Effect of six growth regulators on pod set and seed development in Midwest soybeans.** *Agron. J.* 1959, **51**, No. 8, 510–1. [Purdue Univ. Agric. Exp. Sta., Lafayette, Indiana]

Six growth regulators sprayed on to soyabean plants at flowering time produced no benefit, and in one instance the effect was detrimental.—J.D.J.

714 Gargantini, H. and Catani, R. A. Fixação do nitrogênio do ar atmosférico pelas bactérias que vivem associadas às raízes da soja. [**Fixation of atmospheric N by Rhizobia of soyabean.**] *Bragantia* 1958, **17**, No. 14, 195–204, bibl. 8, illus., English summary. [Received Aug., 1959]

In the trial described, *Glycine max* var. *abura* was grown in pots filled with terra rossa, with or without inoculation and with various fertilizer treatments (NPK or PK, plus limestone in some cases). Results indicated that the soyabean/Rhizobia symbiosis had a low capacity for fixing N from the air.—E.B.O.

## GROUNDNUTS

*See also Abs. 743, 979.*

715 Tella, R. and Canecchio, V. A cultura do amendoim. [**Groundnut cultivation (in Brazil).**] *Agronômico, Campinas* 1959, **11**, No. 1–2, 7–11, illus.

716 Institut National pour l'Étude Agronomique du Congo Belge. [**Groundnuts.**] *Rep. INÉAC 1958*, 1959, 370. [Sta. Essais de Lubarika]

The groundnut variety A 1055 has been multiplied on a large scale. In a spacing trial the highest yields of nuts were obtained from sowing 1 seed at every 5 cm, or 2 seeds at every 10 cm, in rows 40, 50 or 60 cm apart.—E.B.O.

717 Conagin, Cândida, H. T. M. Descrição de algumas variedades do amendoim cultivado (*Arachis hypogaea* L.). [**Description of some varieties of cultivated groundnuts (*A. hypogaea*).**] *Bragantia* 1958, **17**, No. 23, 311-30, bibl. 11, illus., English summary. [Received Aug., 1959]

The botanical and economic characteristics are given of the groundnut varieties Roxo, Tatu, Spanish 2B and NC4. Roxo and Tatu are of the Valencia type, Spanish 2B is of the Spanish type and NC4 of the Virginia type. F. s.—E.B.O.

718 Nagarajan, S. S. and Aiyadurai, S. G. **Effect of trace elements on seedling morphogenesis in *Arachis hypogaea* Linn.** *Curr. Sci.* 1959, **28**, No. 7, 290–1, bibl. 2, illus. [Agric. Coll. and Res. Inst., Oilseeds Section, Coimbatore-3, India]

Seeds of *A. hypogaea* were soaked for 16 hr in solutions of $CuSO_4$, $MnSO_4$, $ZnSO_4$ and $H_3BO_3$, the concentration of each minor element being 200 ppm. In the bunch variety (TMV.2) growth of shoot and root were inhibited, and morphological changes which resulted in production of adventitious roots were observed in the hypocotyl and cotyledon. The spreading varieties (TMV·1 and TMV·3), similarly treated, were slow in germination and growth, but there were no morphological changes. An explanation of the different behaviour of the 2 types of groundnut is given and is based on the effect of minor elements on native auxin in the seed. In this connexion, reference is made to an earlier paper *Fld Crop Abstr.* 11 : 1083.—D.B.

719 Conagin, Cândida, H. T. M. Ovários anormais de amendoim. [**Abnormal ovaries in groundnuts.**] *Bragantia* 1958, **17**, Note 1,

1–3, bibl. 1, illus., English summary. [Received Aug., 1959]

720 Breithof, M. Recherches sur l'influence de quelques substances de croissance sur la ramification de l'arachide. [**Investigations on the effect of some growth substances on the branching of groundnuts.**] *Agricultura, Louvain* 1959, **7**, No. 2, 207–28, bibl. 42, illus., English and Flemish summaries.

In the trials described, 3 antiauxins, triiodobenzoic acid (TIBA), coumarin and MH, tested on groundnuts, inhibited the growth of the terminal buds, but markedly favoured that of the lateral ones, and thus encouraged flowering. The use of TIBA and coumarin was limited by their high phytotoxicity, while MH was effective and only slightly phytotoxic.—E.B.O.

721 Bolhuis, G. G. and de Groot, W. **Observations on the effect of varying temperatures on the flowering and fruit set in three varieties of groundnut.** *Neth. J. agric. Sci.* 1959, **7**, No. 4, 317–26, bibl. 18, illus. [Lab. Trop. Agric., Wageningen, Netherlands]

Groundnut varieties from Indonesia (var. Schwarz 21), Mallorca and the Ukraine, all bunch types, were grown in pots in growth chambers at 18°, 21°, 27°, 30° and 33°C and given 12 hr. light/day. Germination, but no subsequent growth, occurred at 18°C. The Mallorcan variety alone flowered at 21°C, but did not set fruit. Optimum vegetative growth occurred at 30°C in Schwarz 21 and the Mallorcan var. and at 33°C in the Ukraine variety. Optimum fruit-setting occurred between 27° and 30°C in Schwarz 21, at 27°C in the Mallorcan var., and somewhat below 27°C in the Ukraine var. The range of temperatures at which satisfactory fruit-setting took place was greatest in the Ukraine var. and least in Schwarz 21. There was no indication of thermoperiodicity in groundnuts.—R.B.

722 Comber, R. **Effect on the groundnut of variations in supply of potassium, calcium and magnesium.** *Nature, Lond.*, 1959, **184**, No. 4691, 1003, bibl. 2. [Dep. Agric., Gambia]

Culture tests with *Arachis hypogaea* var. Philippine Pink were designed primarily to study Homès' " Method of systematic variation " (*Soils and Fert.* 1955, 18 : 1101) for the determination of major-element requirements. The plants were supplied with 100 mg equivalents of various proportions of K, Ca and Mg, among other elements. Three separate optima of the nutrients (mg equivalents of added K, Ca and Mg) are required for the best yields of tops (dried vegetative parts of the plants, excluding roots), shell and kernels. For example, 80 K, 10 Ca and 10 Mg result in yields (g/pot) of 71·6 tops, 9·9 shell and 1·2 kernel ; 30 K, 40 Ca and 30 Mg produce 24·7 tops, 6·62 shell and 18·0 kernel ; while 15 K, 15 Ca and 70 Mg produce 50·2 tops, 17·0 shell and 1·72 kernel. It is claimed that 200 lb./ac. of potassium chloride can enhance hay yield [above normal] by 30%, with a simultaneous depression in ' nut ' yield of 14%.—M.H.

## PEAS

*See also Abs. 742, 744, 907.*

723 Reynolds, J. D. Vooruitgang op het gebied van droge erwten en conservendoperwten in Engeland. [**Advances in the growing of dry peas and canning peas in England.**] *20 jaren PSC*, Wageningen 1959, 61–75, bibl. 36, illus. [Pea Research Sta., Yaxley, Peterborough]

The following aspects are reviewed : area and development of pea-growing in Gt Britain, manuring, sowing, varieties, weed control, diseases and pests, and harvesting.—G.M.R.

724 Hagedorn, D. J. De voortbrenging van droge erwten in het westen van de Verenigde Staten van Amerika. [**The production of dry peas in western U.S.A.**] *20 jaren PSC*, Wageningen, 1959, 51–60, bibl. 4, illus. [Univ. Wisconsin, Madison]

725 Lammers, R. P. Het rassenonderzoek van conservendoperwten. [**Varietal trials with canning peas.**] *20 jaren PSC*, Wageningen, 1959, 160–75.

Objectives, organization and techniques used in varietal trials are discussed.—G.M.R.

726 Faestraets, L. de. Doperwten en bonen voor conserven in België. [**Peas and beans for conserving in Belgium.**] *20 jaren PSC*, Wageningen, 1959, 76–81. [Nat. Inst. Vered. Verduurz. Groenten, Wezembeek-Oppem, Belgium]

727 Torfason, W. E. and Nonnecke, I. L. **A study of the effects of temperature and other factors upon the germination of vegetable crops. 2. Peas.** *Canad. J. Pl. Sci.* 1959, **39**, No. 1, 119–24, bibl. 9. [Can. Dep. Agric., Lethbridge, Alberta]

Fungicide-treated peas, varieties AA-15, Lincoln and Thomas Laxton, were sown in vermiculite in 1953 and '54, exposed to temperatures of 35, 40, 45 or 50°F for 5, 10 or 20 days, and then transferred to a warm room for completion of germination. Those treated at 45 or 50°F emerged within 5–10 days. Some of the seedlings held at 40°F emerged within 15 days. At 35°F, no seedlings emerged during the exposure period. Total germination of

seedlings exposed to 35°F was significantly lower than that at the other temperatures. Mean germination was 81·5% at 35°F, and 94·8% at 50°F. The percentage germination of Thomas Laxton peas was lower than that of the other varieties. All varieties in 1953, and Lincoln and AA-15 in 1954, tended to show better germination with increasing exposure time. [See *Fld Crop Abstr.* 8 : 843.]—R.B.

728 Brouwer, R. De invloed van de wortel-temperatuur op de groei van erwten. **The influence of root temperature on the growth of peas.** *Jaarb. Inst. Biol. Scheik. Onderz. LandbGew. 1959* 1959, 27–36, bibl. 7, illus., English summary.

Peas were grown under a 17-hr. daylength with their cotyledons resting on perspex sheets, the shoots in air at 17°C and the roots in aerated Hoagland's solution at 7, 11, 15 and 19°C. The shoots of plants grown with roots at 7°C were smaller than those at higher temperatures, and were dark green in colour, with small, stiff leaves, and appeared to be suffering from lack of water. Root temperatures of 11, 15 and 19°C had no differential effect on shoot growth. The percentage reduction in shoot growth at 7°C root temperature, as compared with that at 15°C, was directly proportional to the ratio between the dry weights of shoots and roots, a ratio of 1 being necessary to prevent inhibition of shoot growth. The high starch content of roots at 7°C was considered to be due to the reduced growth at that temperature. The elongation of stems of plants grown for 16 days at 7°C and transferred to 7, 11, 15 and 19°C was more sensitive to changes in root temperature than was shoot dry-matter production. —R.B.

729 Brouwer, R. De invloed van de temperatuur op de ontwikkelingscyclus van erwten. **The influence of temperature on the development of peas.** *Jaarb. Inst.Biol. Scheik. Onderz. LandbGew. 1959* 1959, 17–26, bibl. 101, English summary.

Blue peas, var. Virtus, were grown at 10, 17 and 24°C under a 17-hr. daylength. The initial rate of growth was highest at the high temperature, but vegetative growth ceased at flowering at all temperatures. High temperatures hastened flowering. Plants grown at 17°C flowered after 2 weeks when they had reached a dry-weight of 0·3 g/plant; those grown at 10°C flowered after 5 weeks when they reached a dry-weight of 0·8 g/plant. The assimilatory area per plant and the yield of pods was greater the lower the temperature. The number of seeds/pod was lowest at 24°C, and the weight per seed was lowest at 10°C. Transferring plants from 17°C to other temperatures at various stages of development showed that : (a) high temperatures promoted dry-matter production until flowering, (b) the rate of assimilation was lower after flowering. It was assumed that the accumulation of photosynthetic products after the cessation of growth reduced the rate of photosynthesis.—R.B.

730 Cline, R. A. and Erickson, A. E. **The effect of oxygen diffusion rate and applied fertilizer on the growth, yield and chemical composition of peas.** *Proc. Soil Sci. Soc. Amer.* 1959, **23,** No. 5, 333-5, bibl. 11. [Michigan Agric. Exp. Sta., East Lansing]

731 Veenbas, A. Kwaliteitsproblemen bij peulvruchten. [**Problems of quality in pulse crops.**] *20 jaren PSC,* Wageningen, 1959, 263–8, bibl. 1. [Proefst. Akker. Weidebouw, Wageningen]

In a trial in the North-east Polder, 9 different herbicidal treatments for the control of *Stellaria media* in Rondo peas were compared, one-half of the plots being harrowed several times to control weeds. There was little difference between the harrowed and non-harrowed crops in terms of culinary quality, harrowing improved the quality rather than otherwise and, in particular, resulted in lower percentages of blemished peas. Harrowing resulted in less straw formation and less lodging and reduced the weed population, especially that of *S. media.*—G.M.R.

732 Prummel, J. Hogere opbrengsten van peulvruchten door rijenbemesting. [**Higher yields of pulse crops through the placement of fertilizers in rows.**] *20 jaren PSC,* Wageningen 1959, 196–203, bibl. 6, illus. [Inst. Bodemvruchtbaarheid, Groningen, Netherlands]

Experiments were conducted to compare row-placement and broadcasting of phosphate. Nine of the trials were concerned with peas. The increase in yield from placed fertilizer was considerably greater than where the same quantity was broadcast, and the increase was found to be more marked in the case of pulses than with other crops. —G.M.R.

733 Pea-Growing Research Organization, Ltd. **Annual report 1958.** 1959, pp. 28, Yaxley, Peterborough: Pea-growing Res. Org. Ltd.

Fertilizers (0–16–16 and 6·5–16–16 NPK) applied at 2–4 cwt./ac. and placed in contact with pea seed (var. Zelka) sown in rows 7 in. apart reduced plant populations, especially on a dry seed-bed. In spacing trials, where peas were sown in rows 8, 16 and 24 in. apart at a rate of 168 lb./ac., the closest spacing significantly reduced basal branching capacity and the number of plants with basal branches carrying marketable pods. Applications of 20% granular thimet at 10 lb. a.e./ac., mixed into the top 6 in. of soil on eelworm-infested plots, enabled peas (var. Rondo) to produce a full crop, but did not reduce eelworm

numbers. When vetches (with or without 10 lb. thimet/ac. mixed into the top soil) were cut and removed at the flowering stage and the stubble burnt-off with ammonium dinoseb at 10 lb. a.e./ac., the eelworm population was reduced by >50%. —S.M.J.

734 Riepma Wzn, P. Cultuurmethoden-onderzoek bij conservendoperwten. [**Research on the cultivation of peas for canning and freezing.**] *20 jaren PSC*, Wageningen 1959, 176–86. [Proefst. Akker. Weideb., Wageningen]

Points discussed and illustrated by the results of experiments are : seed disinfection, choice of variety in relation to planting distance, and harvesting stage in relation to yield. Trials of 5 seed disinfectants on Kelvedon Wonder and Rondo indicated the superiority of thiram, followed closely by captan, for this purpose. Exploratory trials (1958) with antibiotics for the control of deep-seated fungi such as *Ascochyta* have shown the need to combine antibiotic treatment with ordinary disinfection. In 4-year trials, the effect of plant spacing on yield was studied in Gloire de Quimper, a very early, short-strawed, non-tillering variety; Celsior, a medium-early variety ; and Lincoln, a late variety and, like Celsior, medium-tillering and with normal straw-length. The very early, short-strawed variety required a considerably denser stand (optimum 90–100 plants per $m^2$) than the later varieties, for which 50–70 plants per $m^2$ were adequate.—G.M.R.

735 Lammers, R. P. Perspectieven voor de peulvruchtenteelt in Nederland. [**Prospects for the growing of pulse crops in the Netherlands.**] *20 jaren PSC*, Wageningen 1959, 15–50.

## BEANS

*See also Abs. 726, 744, 915.*

736 Buishand, T. Teelt- en rassenonderzoek bij bonen. [**Cultural and varietal research with beans.**] *20 jaren PSC*, Wageningen 1959, 146–59, bibl. 7, illus. [Proefst. Groenteteelt, Alkmaar]

Cultural practices for *Vicia faba* and varieties used in the Netherlands are summarized.—G.M.R.

737 Abdel-Samie, M. and others. **Effect of soil texture and fertilizer treatment on phosphorus uptake by horse beans using $P^{32}$.** *Nuclear Sci. Abstr.* 1959, **13**, No. 8 supplement, 814. [Egyptian Atomic Energy Comm., Cairo] [Paper presented at 2nd U.N. Conf. Peaceful Uses of Atomic Energy]

Horse beans [*Vicia faba*] were grown in pots in sand, loamy sand, loam and clay loam soils with 0, 150 or 300 kg $P_2O_5$ per feddan [1 feddan = 4200 $m^2$] and adequate quantities of N and K. Three weeks after germination, equal quantities of $^{32}P$ were added to each pot and plants were harvested 4 days later. Uptake of P was extremely high on sandy soil as compared with other soil types. The higher the original P application the higher was the $^{32}P$ uptake as shown by radiation counts. Roots contained most $^{32}P$, followed by stems and leaves.—R.B.

## *CROTALARIA* SPP.

*See also Abs. 693, 974.*

738 Peltier, M. A. G. Notes sur les Légumineuses – Papilionoidées de Madagascar et des Comores. [**Notes on the Leguminosae – Papilionatae of Madagascar and the Comoro Islands.**] *J. Agric. trop. et Bot. appl.* 1959, **6**, No. 1–3, 22–36, No. 4–5, 185–8, No. 6–7, 267–89 and No. 10, 482–6, illus.

Information, including detailed descriptions, is given on native or acclimatized species of *Crotalaria*. Observations are reported on the use of several of these species as green manures.—E.B.O.

739† Bosser, J. Crotalaires, plantes de restauration du sol. [***Crotalaria* spp. for restoring soil fertility.**] *Bull. Madagascar* 1959, **9**, No. 156, 409-12, illus.

Information is given on species of *Crotalaria* suitable for green manuring. Some wild *Crotalaria* of Madagascar, especially *C. berteriana* and *C. retusa*, could be used for this purpose. Another useful species is *C. juncea*, introduced recently into the island.—E.B.O.

## CHICKPEAS

*See Abs. 554.*

## LUPINS

*See also Abs. 742, 744.*

740† Schagen, R. Schmalblättrigkeit an spätausgesäten gelben Lupinen. [**Small-leafiness of late-sown yellow lupins.**] *Z. PflKrankh.* 1959, **66**, No. 11–12, 685–90, bibl. 9, illus., English summary. [Inst. Landw. Bot., Univ. Bonn, W. Germany]

This condition causes low seed yields of *Lupinus luteus*. Several strains were sown at the normal time (12 March) and 2 months later. About 8–9% of the seedlings which had been sown late exhibited, at the rosette stage, mosaic-like areas on the leaves, and at a later stage, they had deformed small leaves standing out from the stem. Such plants shed their flowers early. Histological examination of the leaves indicated that the deformity could be attributed to disturbances in transpiration and respiration arising, probably, as a result of the plants' reactions to a different time of year. It is unlikely that small-leafiness is a symptom of a virus infection.—D.B.

## LENTILS

741 Ratsimamanga, A. R. and others. Effets de la cortisone sur la croissance de *Ervum lens*. [**Effects of cortisone on the growth of *E. lens*.**] *C.R. Soc. Biol., Paris*, 1958 **152,** No. 6, 960–3.

The growth of young plants of *Ervum lens* [= *Lens culinaris*] is affected by cortisone treatment. This effect is shown both by the weight and length of root and stem, and consists of growth stimulation at low rates and inhibition at higher rates. F. s. —E.B.O.

## GENERAL

*See also Abs. 883, 895.*

742† Turčin, F. V. [**New data on the mechanism of atmospheric-N fixation in nodules of leguminous plants.**] [Russian] *Počvovedenie (Pedology, Moscow)* 1959, No. 10, 14–24, bibl. 8, English summary. [Sci. Res. Inst. of Fertilizers, and Insectofungicides]

The tests were made with *Medicago sativa*, *Pisum sativum*, *Trifolium pratense* and *Lupinus luteus* which were subjected, from 12 to 90 hr., to an atmosphere containing $^{15}N_2$. The Rhizobia were separated from the nodules, and the content of $^{15}N$ determined in the bacterial cells. Under relatively short periods (12–24 hr.) of exposure to $^{15}N_2$, in the above species the labelled N was found in high concentration only in the cell sap of the nodule tissue, and in much lower concentration in the cell sap of the roots, stems and leaves. Fixation of atmospheric N does not take place in the bacterial cells. For N fixation, substances synthesized by sunlight in the leaves are necessary. One of the first products of fixation in the nodules is ammonia.—M.H.

743† Bonnier, C. and Brouwers, L. Nodulation, en tubes de verre, de légumineuses à grosses graines cultivées aseptiquement. [**Nodulation of large-seeded legumes grown aseptically in glass tubes.**] *Bull. Inst. agron., Gembl.* 1958, **26,** No. 4, 317–21, bibl. 4.

Nodules were produced on the roots of inoculated plants of soyabean and groundnuts, grown aseptically in glass tubes, by cutting off the major part of the cotyledons at an early stage ; nodulation in plants grown from whole seeds under the same conditions was practically nil. In soyabean plants grown in tanks containing compost and sand, 90% of those which had been deprived of the cotyledons produced nodules, against 50% of those grown from whole seeds.—E.B.O.

744 Kreyger, J. Drogen en bewaren van peulvruchten. [**Drying and storage of pulse crops.**] *20 jaren PSC*, Wageningen, 1959, 238–54, bibl. 5, illus. [Inst. Bewar. Verwerk. Landbouwprod., Wageningen]

The following aspects are discussed : standards for moisture content after drying and in storage ; effect on seed germination of moisture content and temperature during drying ; drying rate ; consequences of differences in the rate of drying ; installations suitable for drying pulse crops ; results of drying trials (with peas, beans and lupins) ; the drying of unthreshed legumes by the grower ; storage.—G.M.R.

# ROOT CROPS

## SUGAR-BEET

*See also Abs. 886, 903.*

745 Commissie ter Bevordering der Suikerbietenteelt in de Noordelijke Provinciën. Iets over de teelt van suikerbieten op zandgronden. [**Growing sugar-beet in sandy soils.**] *Meded. Inst. rat. Suikerprod.* 1958, **28,** No. 2, 128–33.

The advantages for the farmer of sugar-beet growing are noted and the best cultural techniques for growing sugar-beet on sandy soils are briefly outlined. Weed control on sandy soil, using pre-emergence herbicides, is discussed.—G.M.R.

746 Elema, D. E. Rassen-zaaitijdenproef. [**Varietal and date-of-sowing trial.**] *Meded. Inst. rat. Suikerprod.* 1958, **28,** No. 2, 64–8.

In a trial with 4 sugar-beet varieties sown on 2 different dates, the earlier date (26 March) gave the highest leaf-, root- and sugar-weight, although the sugar content (17·2%) was slightly lower than when the crop was sown on 8 April (17·4%). Very early sowing resulted in an increase of bolters.—G.M.R.

747 Commissie ter Bevordering der Suikerbietenteelt in de Noordelijke Provinciën. Welke invloed hebben dubbele planten. [**The effect of double plants.**] *Meded. Inst. rat. Suikerprod.* 1958, **28,** No. 2, 70–1.

When mechanical beet-thinners are used, 2 or more plants are often left standing together. As a rule these are dealt with by further thinning, but in the present experiment they were left at the rate of 309 double plants per are and results were compared with those of the normally thinned crop. Root yield in the latter was ± 3000 kg per ha higher than when double plants were left, but the sugar content was somewhat lower.—G.M.R.

748 Commissie ter Bevordering der Suikerbietenteelt in de Noordelijke Provinciën. Het op voorraad lichten van ongekopte bieten. [**Lifting untopped beets for storage.**] *Meded. Inst. rat. Suikerprod.* 1958, **28,** No. 2, 93–7, illus.

The process tested consisted in lifting, but not removing, the beets from the soil, so that they remained standing in as far as possible an upright position. The beets could be left for 1–2 weeks before being removed. The percentage sugar content and sometimes sugar weight (in g per beet) tended to increase in the beets left standing, compared with control beets which were lifted and removed immediately, or those which were allowed to continue growing.—G.M.R.

749 Guttay, J. R. and others. **Sugar beet production in Michigan as affected by cropping sequence and fertility level.** *J. Amer. Soc. Sug. Beet Technol.* 1958, **10**, No. 1, 66–75. [Michigan Agric. Exp. Sta., East Lansing]

The necessity for growing lucerne before sugar-beet in order to obtain high yields in Michigan was disproved. Highest yields were obtained in rotations where beet followed sweet clover or beans [*Phaseolus vulgaris*]. Applications of 4–16–8 (NPK) fertilizer at 1000 lb./ac. gave yield increases which were scarcely more profitable than those from applications of 500 lb./ac. These fertilizer levels did not affect sucrose percentage, but an additional nitrogen side-dressing reduced percentage sucrose and gross sugar production in most rotational systems. Sucrose percentages were highest in beets grown in rotations which did not include lucerne.—D.A.L.

750 Rasmusson, J. **Polyploids of sugar beets : use in the culture and the seed production.** *Genet. agr.* 1959, **11**, No. 1–2, 27–64, text in English and Italian. [Hilleshög Sugar-beet Breed. Inst., Landskrona, Sweden]

The results of field trials with diploid and tetraploid sugar-beet varieties, their triploids and their bulk crosses, are discussed. Most of these trials were carried out in Sweden, but others were also conducted in the Netherlands, Belgium, France and N. Italy. The characteristics considered were : root yields per ha, sugar content and yield, noxious N per 100 g of sugar, K + Na per 100 g of sugar, and bolting. In Sweden, the averages of the best pure tetraploid varieties were almost the same as those of the best diploid varieties, with a slight superiority in yield in favour of the tetraploids. Bolting was decidedly lower in the tetraploids than in the diploids. Hybridization had practically the same effects on the tetraploids as on the diploids. The root and sugar yields and percentage of sugar of the hybrids were higher than the averages of the parents, while the K + Na and noxious N contents were lower in the hybrids and their tendency to bolt increased slightly. The tetraploid hybrids had a higher noxious N, and lower tendency to bolt, than the diploids. In the Netherlands, Belgium, France and especially in Italy, the tetraploid bulk crosses gave much higher yields than the diploids. In Sweden the pure triploids were markedly superior in yield and sugar content to the best tetraploids and diploids, and were intermediate with regard to noxious N and bolting. In practice, the polyploid bulk cross (2n + 3n + 4n) is now the most important. In Sweden this polyploid type yields more, bolts less, has less K + Na, and a higher noxious N content, than the diploid type. This superiority of the polyploid type is even greater in the Netherlands, Belgium, France and especially in N. Italy. The production of tetraploid or " polyploid " seed presents some difficulties because the tetraploids develop somewhat slower and produce less pollen than the diploids, but in practice these difficulties have been overcome. F. S.—E.B.O.

751 Donà dalle Rose, A. Valore teorico e pratico dei tipi di barbabietola migliorati sulla base della poliploidia indotta con riferimento ad un sessennio di coltura in Italia. [**Theoretical and practical value of sugar-beet types improved by means of induced polyploidy with reference to cultivation during 6 years in Italy.**] *Genet. agr.* 1959, **11**, No. 1–2, 65–78, bibl. 14, illus., English summary. [Sta. Sper. Bieticolt., Rovigo, Italy]

About 9–10% of the sugar-beet seed sown in Italy during 1956–7 was of the polyploid type (both the Italian type Cesena and foreign types were used), and this type showed an increase in 1958. After 6 years of cultivation it is concluded that polyploid sugar-beet varieties are adapted to the Po valley, and also to S. Italy, Sicily and Sardinia, and that, provided they are sown early, they yield the same as, and sometimes more than, the best diploid varieties.—E.B.O.

752 Baldoni, R. La produzione italiana del seme di bietola. [**The production of sugar-beet seed in Italy.**] *Industr. saccar. ital.* 1959, Special No., 208–13, bibl. 9, English summary.

This article is concerned with the history of the production of sugar-beet seed in Italy which now produces more than 60% of her requirements. [See also *Fld Crop Abstr.* 11 : 1108.]—E.B.O.

753 Rasmusson, K. Naturligt och artificiellt enkornfrö och dess användning inom sockerbetsodlingen. **Processed and genetically monogerm seeds and their uses in sugar-beet cultivation [in Sweden].** *K. Skogs Lantbr-Akad. Tidskr.* 1959, **98**, No. 4, 224–38, bibl. 10, illus. English summary. [Jälla Lantmannaskola, Uppsala, Sweden]

The use of rubbed and graded sugar-beet seed in Sweden is discussed. This type of seed contains an average of 1·6 viable seeds per cluster and it is used on about half the area under sugar-beet in Sweden. Pelleted sugar-beet seed has not proved successful because of low germination. The present

position in the production of genetically monogerm seed in the USA is reviewed. Monogerm sugar-beet varieties produced in the USA are not well adapted for use in the N.W. Europe and it is considered that it will take between 12 and 20 years to produce monogerm varieties adapted to this region.—P.J.B.

754 Hopma, W. H. Onkruidbestrijding met IPC en DCP. [**Weed control with propham and dalapon.**] *Meded. Inst. rat. Suikerprod.* 1958, **28**, No. 2, 76–82.

The most satisfactory control of *Alopecurus myosuroides* and *Poa annua* in sugar-beet was obtained with 7·5 kg propham sprayed 14 days before sowing, or 5 kg propham applied 5–7 days before sowing. In the case of heavy weed infestations 5 kg propham, applied just before singling, gave satisfactory results.—G.M.R.

755 Louwes, H. J. Bietenvlieg-bestrijdingsproef. [**Beet-fly control.**] *Meded. Inst. rat. Suikerprod.* 1958, **28**, No. 2, 71–3.

Comparison was made of 1 and 2 applications, respectively (13 May and 3 June) of parathion or dieldrin in 1000 l water per ha to control a moderate infestation of *Pegomya hyoscyami* var. *betae*. Good control was achieved, but yields were not affected by treatment.—G.M.R.

756 Holst, E. M. and Cormany, C. E. **Effects of some soil treatments on yield of sugar beets in soil infected with sugar beet nematode and Rhizoctonia root-rot.** *J. Amer. Soc. Sug. Beet Technol.* 1958, **10**, No. 1, 56–59. [Holly Sugar Corp., Swink, Colorado (E.M.H.) and Sheridan, Wyoming (C.E.C.)]

A range of chemicals was used on infected soils prior to sowing sugar-beet in an effort to control nematodes and root rot. The only material to provide satisfactory control was methyl bromide.—D.A.L.

757 Henkens, C. H. and Lehr, J. J. Borium op bouwland. [**Boron in arable land.**] *Landb-Voorl.* 1959, **16**, No. 7, 339–44, illus. [Inst. Bodemvruchtbaarheid, Groningen, and Lab. Bemestingsonderz., Wageningen, Netherlands]

Examination of soil samples from sugar- and fodder-beet fields showed that where the B content of the soil as determined by hot water extraction lay below 0·35 mg/kg soil in a dry year, or 0·3 mg/kg in a wet year, heart-rot occurred in the majority of beet crops ; where the B content of the soil was higher than these values very few cases of heart-rot occurred. There was a positive correlation between the B content of the soil and that of leaf-blade tissue. Soil pH had little or no effect either on the incidence of heart-rot or on the B content of leaf-blade tissue.—R.B.

758† Sommer, E. Ein Beitrag zur kurzfristigen Unterscheidung des Saatgutes von Zuckerrüben und Zuckerfutterrüben. 2. Mitteilung. [**A rapid method for distinguishing between seed of sugar-beet and sugar-fodder-beet. 2nd communication.**] *Saatgut-Wirtsch.* 1959, **11**, No. 12, 358-9, bibl. 4. [Inst. PflZücht. Kleinwanzleben, E. Germany]

The method described in *Fld Crop Abstr.* 8 : 1309 gives results which vary according to weather during growth and seed formation and according to time of harvesting and length of storage period. The seeds can be distinguished with certainty only when produced under similar conditions. This shortcoming has been remedied by determining total amylase activity, i.e. bound as well as free amylase. Bound amylase was hydrolyzed by the proteolitic enzyme papain in the form of " Papayotinum Merck." By this method, details of which are given, seed of the sugar-fodder-beet varieties (Dickwanst and Ovana) showed a higher total amylase activity than seed of sugar-beet varieties (Kleinwanzlebener E and Kleinwanzlebener N). This difference was maintained for seed produced under various conditions and stored for different periods.—D.B.

759 Dubetz, S. **The effect of fertilizers and osmotic pressure on germination.** *J. Amer. Soc. Sug. Beet Technol.* 1958, **10**, No. 3, 212–9, bibl. 12, illus. [Exp. Fm, Can. Dep. Agric., Lethbridge, Alberta]

Decorticated seed of Kuhn sugar-beet was sown in a glasshouse in soil containing 25, 50 and 75% of the moisture available at field capacity and dressed with (a) 50 lb. $P_2O_5$/ac., (b) 25 lb. N + 50 lb. $P_2O_5$/ac., (c) 50 lb. N + 50 lb. $P_2O_5$/ac., (d) mannitol, to give an osmotic pressure equal to that of treatment (b). At the lowest moisture level, germination of unfertilized controls was significantly greater than that where treatments (a) to (d) were used. At the highest moisture level, germination after treatment (a) was significantly greater than that after treatments (b) to (d) ; differences between treatments (b), (c) and (d) were not significant. At the intermediate moisture level the germination of (a) was significantly greater than that of the controls. Seed germination in the control treatments was relatively unaffected by the soil-moisture levels used. Germination studies were carried out *in vitro* using solutions of mannitol and $NH_4NO_3$ to give 2–10 atm. osmotic pressure, prepared according to freezing-point depression data. Seed germination was not affected by 2- and 4-atm. solutions and only slightly reduced by 6-atm. solutions ; stronger solutions caused a significant reduction. Germination in 10-atm. solution was significantly lower in $NH_4NO_3$ than in mannitol.—R.B.

760 Karuna, V. A. [**A 3-cotyledon specimen of *Beta vulgaris* L.**] [Russian] *Bot. Ž. SSSR* (*Bot. J., USSR*) 1959, **44**, No. 9, 1340–1.

[Hydrometeorol. Observatory, "Stoney Steppe", Talov Region, Voronez Province, USSR]

This specimen was observed in a sowing (18 May, 1958) of the sugar-beet variety Ramonskaja 731. The seedling developed into a more robust plant than the remainder and the primary root had 3 rows of laterals instead of the normal 2. The plant is being tested to determine whether the 3-cotyledon character is heritable.—M.H.

761 Wort, D. J. and Shrimpton, D. M. **Effect of frost defoliation on the respiration of the mature sugar beet root.** *J. Amer. Soc. Sug. Beet Technol.* 1958, **10,** No. 1, 29–33. [Univ. British Columbia, Vancouver]

Frost-defoliation of mature sugar-beets resulted in root-tissue respiratory rates slightly higher than those of the roots of untreated controls during the first 4 days following defoliation, but lower rates than those of the controls during the remainder of a 16-day period. The final percentage sucrose on a fresh-weight basis was lower in the roots of defoliated plants, because of uptake of soil water without its loss by transpiration, but there was no significant change in sucrose percentage on a dry-weight basis.—D.A.L.

762 Hosokawa, S. **Studies on the so-called "harmful nitrogen" in sugar-beet root.** [Japanese] *Rep. No. 51. Hokkaido nat. agric. Exp. Sta.* 1959, pp. 110, bibl. 276, illus., English summary.

The factors which influence the accumulation of toxic N in the sugar-beet root were investigated. These include: the quantity and kind of N fertilizer, the relative proportions of N, P and K, variety cultivated, density of planting, distribution of harmful N in the root, size of root, topping, time of harvesting, freezing during storage, soil and climate. By using a mixture of $BaCl_2$ and $Ba(OH)_2$ the author improved the colorimetric method of Stanek and Palvas for determining toxic N. F. Eng. s.—D.B.

763 Scaramella Petri, Piera. Caratteri strutturali e presenza di fibre in diverse varietà di bietole. [**Structural characters and presence of fibres in different varieties of sugar-beet.**] *Genet. agr.* 1959, **11,** No. 1–2, 90–6, bibl. 5, English summary. [Ist. Bot. Univ. Bologna, Italy]

Histological investigations carried out in Belgium in 1956–7 and in the Netherlands in 1958 showed an abnormal development of fibres in some polyploid sugar-beet varieties. F. s.—E.B.O.

764† Bosman, J. C. Droge-stofgehalte en refractometerwaarde bij bieten. **Dry-matter content and refractometer value in beet.** *Jaarb. Inst. Biol. Scheik. Onderz. LandbGew. 1959* 1959, 11-15, English summary.

The dry-matter content and refractometer value of vascular bundle and parenchyma tissue from a crop of Barres mangels harvested on 11 dates between 10 Oct. and 11 Dec. were determined. A close positive correlation was found between refractometer values and dry-matter content. Vascular bundles contained a greater percentage of dry-matter than parenchyma. The percentage dry-matter in vascular bundle and parenchyma tissue, and the differences between these tissues in dry-matter content and refractometer values, remained similar at all dates of harvesting. In a crop of sugar-beet lifted on 6 Oct., 24 Nov. and 2 Mar., the refractometer values of vascular bundle and parenchyma tissue increased, while the difference between them decreased, with later harvesting.—R.B.

765 Kursanov, A. L. and others. **The glycolytic enzymes in the conducting tissues of sugar beet.** *Arch. Biochem.* 1959, **83,** No. 1, 239–47, bibl. 32. [K. A. Timiriazev Inst. Pl. Physiol., Moscow]

The enzymes hexokinase, phosphohexose isomerase, and aldolase have been detected in the fibro-vascular bundles of sugar-beet. Phosphoglucomutase was not found. It is suggested that the glycolytic process plays an important role in transformations of sugars of sugar-beet. F. s.—E.B.O.

766 Ulrich, A. and others. **Effects of climate on sugar beets grown under standardized conditions.** *J. Amer. Soc. Sug. Beet Technol.* 1958, **10,** No. 1, 1–23.

Sugar-beet plants were grown outdoors in pots under standardized conditions at 17 locations in the major sugar-beet-growing areas of the USA. At each location, the standard variety S.P.53104–0 and a local variety of beet were sown and harvested at standard (1 May-15 Oct.) and local times. Sucrose concentrations of roots at most locations, and fresh weight of tops in all cases, were inversely related to the minimum accumulated night-temperatures in the 4 weeks prior to harvest. Root weight was primarily a function of the sugar not used for top growth or respiration, and crown weight a function of climate, variety and age of the plant.—D.A.L.

767 Snytko, A. I. [**Growth characteristics of irrigated sugar-beet in central Kulunda.**] [Russian] *Doklady Vsesojuz. Akad. S.-H. Nauk (Proc. Lenin Acad. Agric. Sci.)* 1959, **24,** No. 6, 15–18. [Siberian Div., Acad. Sci. USSR]

A distinguishing feature of the climate in central Kulunda [approx. 53°N., 75°E.] is the short growing period and repeated droughts in spring and summer. Yields of irrigated sugar-beet amount to 43,000 kg/ha with 19–20% sugar con-

tent in the roots. The vegetative period in central Kulunda is 120–135 days, compared with 160–170 days in the Ukraine, but there is intensive growth during July/Aug. which results in the growth curve for beet at Kulunda being much steeper than that in the Ukraine. The duration of the life of the beet leaves in Kulunda, after completing their growth, varies widely between 9 and 56 days. The assimilating area per plant is less in Kulunda than in the Ukraine because of the fewer number of leaves per plant. However, irrigation in the Kulunda steppe results in : (1) a curtailment of the period during which the successive leaves appear ; (2) an increase in leaf number and therefore of assimilating area ; and (3) an increase in the length of the active growth period of the leaves. It is computed that for a sugar-beet root yield of 43,000 kg/ha in Kulunda, the productivity of the leaf apparatus is 13 g or more dry substance per day from 1 sq. m of leaf surface. In the Ukraine for the same root harvest the figure is 11 g. It is maintained that the growth of the roots and leaves and the sugar accumulation in the beet crops in central Kulunda differ from those of the basic regions of sugar-beet production, being dependent on climatic conditions at different phases of the plants' growth.—M.H.

768 Peterson, D. F. **Effect of gibberellic acid on germination, sucrose and yield of sugar beets.** *J. Amer. Soc. Sug. Beet Technol.* 1958, **10**, No. 1, 53–5. [Holly Sugar Corp., Sheridan, Wyoming]

Pre-sowing spray treatments of sugar-beet seed with GA at 3 concentrations did not affect the percentage or vigour of seed germination. Concentrations of 100 and 500 ppm sprayed on growing plants reduced percentage sucrose and tended to result in an increase in yield of roots per acre, without significantly increasing yield of sugar per acre.—D.A.L.

769 Nelson, R. T. and Wood, R. R. **Studies of chemical treatments on sugar beets including gibberellic acid, 2,4-D and maleic hydrazide.** *J. Amer. Soc. Sug. Beet Technol.* 1958, **10**, No. 1, 76–9. [Great Western Sugar Co., Longmont, Colorado]

GA as a 10 ppm aqueous solution applied at 100 gal./ac. to the foliage of sugar-beets 6 weeks before harvest significantly increased root yield and sugar production per acre. Higher concentrations or later applications tended to increase root yields, but these were offset by decreases in sucrose percentages. No yield responses were obtained with 2,4-D or MH applications, and respiration rates of harvested roots were unaffected by any of the treatments.—D.A.L.

770 Statens Forsøgsvirksomhed i Plantekultur. Roetoppens gødningsværdi. [**The manurial value of root tops.**] *Medd. 628 Stat. Forsøgsvirk. Plantekult.* 1959, pp. 2.

The trials reported were carried out during 1954–8 at 7 locations in Denmark. Barley was used as a test crop and determinations were made of the manurial value of the following (rates per ha) : (a) 350 hkg sugar-beet tops, containing 54·6 hkg dry matter, (b) 250 hkg fodder-beet tops, containing 34 hkg dry matter and (c) 100 hkg swede tops, containing 14·3 hkg dry matter. A basal dressing of 200 kg superphosphate and 200 kg K salts/ha was applied to all plots. Compared with where the basal treatment, only, was applied, rates of 200 and 400 kg calcium nitrate/ha resulted in grain yield increases of 11·1 and 16·8 hkg/ha, while treatments (a), (b) and (c) raised grain yields by 11·8, 9·2 and 7·7 hkg/ha. From these results, it was calculated that treatments (a), (b) and (c) were equivalent to 219, 153 and 121 kg calcium nitrate/ha, respectively. The fodder value of root tops was much higher than their manurial value and it was concluded that, for Danish conditions, root tops should be used as fodder and not as manure.—P.J.B.

771 Tolman, B. and Johnson, R. C. **Effect of nitrogen on the yield and sucrose content of sugar beets.** *J. Amer. Soc. Sug. Beet Technol.* 1958, **10**, No. 3, 254–7. [Utah-Idaho Sugar Co., Salt Lake City]

Results of field trials with irrigated sugar-beet showed that in Utah, Idaho and S. Dakota, maximum sugar yields per acre were produced with 120 lb. N/ac., and the optimum N-application was 100 lb./ac. In the older farming areas in Washington the optimum rate of N was 120 lb./ac., while on newly cultivated land where irrigation had been practised for 4-5 yr. only, the optimum rate was 175–200 lb./ac.—R.B.

772 Roussel, N. La fumure minérale azotée de la betterave sucrière. Résultats des essais effectués en 1956 et 1957. [**The mineral N manuring of sugar-beet. Results from trials in 1956-7.**] *Publ. tech. Inst. belge Amélior. Better.* 1959, **27**, No. 2, 45–82, English and Flemish summaries.

The results from the trials described, carried out with the varieties Zwaanesse III – E and Maribo P polyploid (which have different sugar contents) on different soil types, showed that : (a) the highest root yields were obtained with an application of 150–180 kg N/ha ; (b) the highest sugar yield was obtained with 150–180 kg N/ha in 1956 and 120–150 kg/ha in 1957 ; (c) the two varieties behaved differently in 1956 and similarly in 1957.—E.B.O.

773 Allos, H. F. and Macksoud, S. W. **Yields of sugar beet and sugar content as influenced by applications of Chilean nitrate,**

**superphosphate, and water.** *Fac. Agric. Sci., Amer. Univ. Beirut, Lebanon* 1958, Pub. No. 5, pp. 31, bibl. 23.

The yield of sugar-beet was increased by supplementary irrigation, totalling 55 cm water given whenever soil moisture fell to 70%. Yields were also greatly increased when N and P were applied together. The most profitable rate of Chilean nitrate application was about 600 lb./ac. Sugar percentages were not significantly affected by these treatments.—J.D.J.

774 Institut Belge pour l'Amélioration de la Betterave. Les engrais verts et la betterave sucrière. [**Green manures and sugar-beet (in Belgium).**] *Publ. Vulg. Inst. belge Amélior. Better.* 1959, No. 1, pp. 12, illus.

Information is given on growing green manures for increasing yields of sugar-beet. These green manures are either sown in spring in a cereal, species used being *Medicago lupulina, Trifolium pratense, T. repens* and *T. hybridum*, or they are grown in summer after an early-harvested crop (flax, winter-sown barley), species used in this case being *Vicia sativa, V. faba, Pisum arvense* and *T. incarnatum*.—E.B.O.

775 Commissie ter Bevordering der Suikerbietenteelt in de Noordelijke Provinciën. Iets over suikerbieten en suikerbietenopbrengsten. [**Sugar-beet and sugar-beet yields.**] *Meded. Inst. rat. Suikerprod.* 1958, **28**, No. 2, 139–42.

The mean annual figures are given for the percentage sugar content and the yield of sugar-beet in the Netherlands from 1904 to 1955. Comparison of the average figures for the Netherlands during 1946–55 with those for 14 other countries shows the Netherlands yield to be highest of all. The use of polyploid varieties has greatly increased since 1955.—G.M.R.

776 Lees, S. B. **Some economic aspects of sugar beet growing in the west of England.** *Publ. N/S 86 Univ. Bristol Dep. Econ.* 1959, pp. 31, mimeo.

A survey was conducted in 1956 on 105 farms in Somerset, Herefordshire and Worcestershire. Costs were much higher where machinery was not used in harvesting. Profit margins compared favourably with cereals, but unfavourably with potatoes, and percentage returns compared unfavourably with other crops. The attraction of the crop is the value of the tops as stock-feed.—J.D.J.

## FODDER-BEET

*See also Abs. 757, 758, 764, 770, 888.*

777 de Wit, C. T. Over standruimte van bieten. **On spacing of beets.** *Jaarb. Inst. Biol. Scheik. Onderz. LandbGew. 1959* 1959, **129-34**, bibl. 7, English summary.

From theoretical considerations, the relationship between yield ($O_x$) and the space available for each plant (x) is : $O_x = O_o \left(\frac{A}{A+X}\right)$ where $O_o$ is the extrapolated theoretical yield at infinite stand density and A is a constant depending on growing conditions. This relationship is valid only in the region where yield increases with increasing stand density, and can be represented as a linear relationship between plant spacing and the reciprocal of the yield. [See *Fld Crop Abstr.* 12 : 1525.] Data from a large number of experiments on spacing of fodder-beet were found to be in accord with this relationship. It was shown that optimum plant density was not achieved at the highest densities used, namely 800–900 plants/are. In several sugar-beet spacing trials, the optimum population in terms of sugar yield was about 900 plants/are in high-yielding areas. The effect of plant population on yield in low-yielding areas was much smaller, probably on account of a limited supply of nutrients.—R.B.

778† FAO. **Report of the FAO uniform trials with strains of fodder beets with a high dry-matter content.** *FAO/59/4/2580* 1959, pp. 18.

A summary is given of results (mainly in tabular form) from trials carried out in Europe in 1954–7 with 16 varieties of fodder-beet of 12–22% dry-matter content. For these trials, fodder-beet seed from Denmark, Germany, the Netherlands and Sweden was distributed to 11 countries.—E.B.O.

779† Séchet, J. Action des basses températures sur les semences de betterave en germination. [**Effect of low temperatures on germinating seeds of [fodder-] beet.**] *C.R. Acad. Agric. Fr.* 1959, **45**, No. 17, 879–81, bibl. 2.

Seeds of [fodder-] beet were germinated at 23°C and then kept at 2°C for 45 or 57 days before being sown on 31 May. Treated seed produced plants of greater total weight, length and weight of roots at harvest than did untreated seed. The plants from seed treated for 45 days were superior in these respects to those from seed treated for 57 days.—E.B.O.

## CARROTS

*See Abs. 987.*

## POTATOES

*See also Abs. 916, 1033, 1037.*

780 Siebeneick, H. Standortgerechter Kartoffelbau. [**Growing potatoes in the right habitats.**] *Bayer. landw. Jahrb.* 1959, **36**, No. 3, 259–75.

This paper brings together information on the conditions of soil and climate and on the cultiva-

tion measures which are requisite for good potato yields and economic returns. The marketing of potatoes, whether for ware, seed, fodder or industrial use, is discussed.—D.B.

781 Reestman, A. J. and de Wit, C. T. **Yield and size distribution of potatoes as influenced by seed rate.** *Neth. J. agric. Sci.* 1959, **7**, No. 4, 257–68, bibl. 6. [Inst. Biol. Schiek. Onderz. LandbGew., Wageningen, Netherlands]

Five spacing experiments were carried out in 1957 and '58 with seed potatoes, var. Alpha, measuring 25–28 mm, 35–45 mm and 45–60 mm, planted at 400, 600, 800, 1000 or 1200 tubers/ha in rows 60 cm apart and harvested on 7 dates between 29 July and 16 Oct. There was a positive correlation, within experiments, between the number of stems produced per tuber at wide spacings and the surface area of the skin of the tubers, both where whole tubers and cut setts were used. There was a linear relationship between the reciprocal of the yield and the reciprocal of the seed rate where both were expressed in $m^2$ of skin surface/are. [See *Fld Crop Abstr.* 12 : 1525 and 13 : 777.] Where the reciprocal of the yield for each sett size was averaged for all 5 experiments and plotted against the reciprocal of the seed rate, it was shown that the use of large seed depressed yields ; this was considered to be due to the less regular distribution of haulms in the row where the large seed was used. Seed size had little influence on grading. Rows 60 cm apart were considered too widely spaced for maximum production.—R.B.

782 Houghland, G. V. C. and Akeley, R. V. **Effects of seed spacing and fertilizer rate on field performances of potato varieties and on financial returns.** *Amer. Potato J.* 1959, **36**, No. 7, 227–34. [Crops Res. Div., Agric. Res. Serv., USDA, Beltsville, Md]

Saco, Kennebec, Katahdin and Merrimack potatoes were grown at Presque Isle, Maine, with 1000, 1200, 1400 or 1600 lb. of 10–15–15 (NPK) fertilizer/ac., and seed tubers were spaced 6, 9 or 12 in. apart. Maximum yields were obtained with 1400 lb. fertilizer/ac. Saco gave the highest yields of tubers greater than 2 in. diam., followed by Kennebec, Katahdin and Merrimack. Except at the closest spacing, the highest yield of Merrimack was lower than the lowest yield of any other variety. Merrimack appeared to be least well adapted for intensive production. Yields increased with reductions in plant spacing ; the increase was significant for all varieties except Merrimack. Average weights of Saco and Kennebec were significantly greater than those of Katahdin and Merrimack at all row spacings. Saco and Kennebec required close spacing to avoid production of oversized tubers. Kennebec produced the smallest number of tubers per plant at each seed spacing, Saco the greatest number. The greatest financial returns were obtained with 6-in. spacings and 1400 lb. fertilizer/ac.—R.B.

783 Bishop, J. C. and Wright, D. N. **The effect of size and spacing of seed pieces on the yield and grade of White Rose potatoes in Kern County, California.** *Amer. Potato J.* 1959, **36**, No. 7, 235–40, bibl. 8. [Univ. California, Davis]

Cut setts of White Rose potatoes weighing 1, 1·5 or 2 oz. were grown in rows spaced 32 in. apart, with 7·5 or 15 in. between setts in the row. Total yields of tubers were increased by increasing the sett weight and decreasing the spacing in the row ; increases in yields of No. 1 ware potatoes were slightly less. There was little difference in yield between 1-oz. setts spaced 7·5 in. apart and 2-oz. setts spaced 15-in. apart ; these were the most economic rates of planting. Large setts spaced 7·5-in. apart produced the highest proportion of undersized tubers. Tuber size was influenced more by spacing than by sett weight.—R.B.

784 Jähnl, G. Über das Schneiden und die Grösse von Saatkartoffeln. [**The cutting and the size of seed potatoes.**] *Z. Acker- u. PflBau* 1959, **107**, No. 4, 518–28, bibl. 28. [Bundesversuchsanst. f. alpenländische Landwirtschaft Gumpenstein, Austria]

Seventy-five experiments carried out in different years showed that the planting of cut seed potatoes lowers the yield. Whether whole or cut potatoes were used, large tubers gave significantly better yields than small ones. F. Eng. s.—D.B.

785 Institut National pour l'Étude Agronomique du Congo Belge. [**Potatoes.**] *Rep. INÉAC 1958*, 1959, 385–6, 393, 438–9 and 441.

In a potato trial at Keyberg, Katanga, the varieties Scotch Afrique du Sud, Gineke and Scotch Écosse yielded best (21,799, 20,453 and 20,313 kg tubers/ha, respectively). At Kaniama, Upper Lomami, the variety Industrie was best (20,593 kg tubers/ha). At Ndihira, Northern Kivu, the spacing of 50 × 50 cm (40,000 plants/ha) gave the highest yield ; the varieties Sientje, Eigenheimer and Libertas, yielded 13–21 metric tons tubers/ha when planted in March and harvested in June, and 9–12 tons/ha when planted in June and harvested in Oct.—E.B.O.

786 Estrada, R. N. and others. Diacol Monserrate, una nueva variedad de papa. [**Diacol Monserrate, a new potato variety (in Colombia).**] *Bol. Divulg. 6 Dep. Invest. agropec. Colombia* 1959, pp. 23, bibl. 1, illus.

787 Barnes, G. L. **Herbicidal agents as possible aids for roguing diseased seed-**

**potato plants.** *Amer. Potato J.* 1959, **36,** No. 6, 212–8, bibl. 17. [Oregon Agric. Exp. Sta., Corvallis]

Several herbicides were tested for their ability to kill diseased potato plants and aphids and to prevent resprouting of setts and tubers. Diesel oil plus either 0·4% 2,4,5-T triethanolamine ester, 30% propham emulsion or 1% Dow general weed killer (55% dinoseb) were found suitable for this purpose.—R.B.

788 Campacci, C. A. Contrôle da " queima das fôlhas " da batatinha. [**Control of early blight on potatoes (in Brazil).**] *Biológico, S. Paulo* 1959, **25,** No. 10, 212–14, illus.

From trials in the region of Presidente Prudente it is concluded that early blight (*Alternaria solani*) of potatoes is controlled by spraying with dithane M-22 0·2% (200 g/100 l water).—E.B.O.

789 Moore, D. H. **Field evaluation of thiodan as an insecticide for potatoes.** *J. econ. Ent.* 1959, **52,** No. 4, 564–7, bibl. 10. [Res. Devel. Dep., Niagara Chem. Div., Food Machinery and Chem. Corp., Middleport, New York]

Thiodan at 0·5 lb./ac. effectively controlled potato flea beetles (*Epitrix cucumeris*), leaf hoppers (*Empoasca fabae*) and Colorado beetles (*Leptinotarsa decemlineata*) when applied as a foliar spray, either alone or in combination with fungicides, and increased tuber yields to a greater extent than did parathion at 0·25 lb./ac., dieldrin at 0·18 lb./ac. or DDT at 0·8 lb./ac.—R.B.

790 Begg, J. A. **Control of the eastern field wireworm, *Limonius agonus* (Say), in early potatoes in Ontario by application of insecticides to the soil.** *Canad. J. Pl. Sci.* 1959, **39,** No. 3, 342–9, bibl. 23. [Can. Dep. Agric., Chatham, Ontario]

Irish Cobbler potatoes were planted 2, 3 or 4 years in succession on sandy loam soil heavily infested with *L. agonus* and treated each year before planting with 5 lb. of one of 9 insecticides. At least 95% of marketable potatoes (not more than 1 wireworm puncture per tuber) were obtained from each plot treated with dieldrin or heptachlor, and from 6 out of 9 plots treated with aldrin, and from 5 out of 9 plots treated with chlordane. Control plots produced 24–66% marketable tubers.—R.B.

791 Fox, C. J. S. and Smeltzer, G. G. **Control of the European wireworm *Agriotes obscurus* in Nova Scotia with insecticides applied to the soil.** *Canad. J. Pl. Sci.* 1959, **39,** No. 4, 498–500, bibl. 3. [Can. Dep. Agric., Kentville, Nova Scotia]

Wireworm injury to potatoes grown in 1954 following soil applications of 20% aldrin emulsion, 5% aldrin granules or 20% heptachlor emulsion at 3 lb. a.i./ac. was not significantly reduced by insecticide treatment, but yields of a following crop of oats were significantly increased.—R.B.

792 Hague, N. G. M. **Effect of methyl bromide fumigation on the potato root eelworm.** *Pl. Path.* 1959, **8,** No. 2, 68–70, bibl. 6. [Imp. Coll. Field Sta., Sunninghill, Berks]

The treatment, with water, of cysts of *Heterodera rostochiensis* before fumigation with methyl bromide enhanced the penetration of the fumigant. F. s.—D.B.

793 Arenz, B. Grundsätzliches über Frühroden [**The principles involved in early destruction of tops.**] *Kartoffelbau* 1959, **10,** No. 6, 130–1. [Bayerische Landessaatzuchtanstalt, Weihenstephan, W. Germany]

The potato plant is most susceptible to virus infection in the developmental stage before flowering, after which resistance due to age sets in. To avoid virus infection, the flowering stage is brought forward by pre-sprouting, moderate N manuring to favour the developmental stage, and the earliest possible planting in keeping with the conditions of the area. Infection at a later stage is prevented by destroying the tops either by hand-pulling (the best method), mechanical injury, spraying with chemicals, or a combination of these last two. The tubers are lifted 2–3 weeks later. The time for destroying the tops is determined by both the time of the mass flight of the vectors and (for economic reasons) the stage of development of the tubers. In 1959, a service to give warning of the correct time for destroying potato tops was introduced into Bavaria. A network of stations determines (a) the time of mass insect flight (from observations at the nymph stage) and (b) the size reached by tubers of early, medium, and late varieties grown on tuber-sampling plots. It is important to allow vegetative growth to continue to the latest safe date since, during the period latter part of July to beginning of August, the daily increase in tuber yield is 500 kg/ha. The economics of early destruction of tops is briefly mentioned. The lower weight of harvested tubers per hectare (compared with those from normal harvesting) is caused by a reduction in the size, not number of tubers. The size produced is suitable for seed potatoes. The number of tubers per 100 kg could be adopted as a selling point.—D.B.

794 Brücher, H. Kritische Betrachtungen zur Nomenklatur argentinischer Wildkartoffeln. 6. Die Serie *Alticola* (= *Megistacroloba*). [**Critical observations on the nomenclature of Argentinian wild potatoes. 6. The *Alticola* series.**] *Züchter* 1959, **29,** No. 6, 257–64, bibl. 9, illus., English summary.

See also *Fld Crop Abstr.* 12 : 1881.—D.B.

795 Corner, J. J. and Harborne, J. B. **Cinnamic acid derivatives of potato berries.** *Chem. and Industr.* 1960, No. 3, 76, bibl. 6. [John Innes Hort. Inst., Bayfordbury, Hertford, Herts]

796 Toosey, R. D. **Control of sprout numbers in maincrop potatoes.** *Agriculture, Lond.* 1959, **66,** No. 8, 346–50, illus, bibl. 7.

In an attempt to limit the sprouting of maincrop potatoes to 1 or 2 sprouts per seed tuber by natural means, investigations were begun in Sept. 1958 on the effect of sprouting, weight and origin of the seed on the number of sprouts produced per seed tuber. Small, medium and large tubers were treated as follows : (a) chitting in trays in a warm glasshouse from 8 Oct. ; (b), as (a), but in a lighted store heated only in frosty weather ; (c) as (b) but trays darkened, sprouts removed and tubers placed in a warm glashouse in Feb. 1959 ; (d) stored at 36°F to prevent sprout growth and placed in trays in the glasshouse on 8 Jan. ; (e) as (d) but on 28 Mar. Only treatment (c) resulted in the production of 1 or 2 sprouts per sett. Once the single sprout, usually apical, which suppresses the growth of further sprouts was established, it was desirable to lower the store temperature to prevent the production of excessively large sprouts likely to exhaust the seed. The number of sprouts per seed tuber increased as tuber weight increased.—S.M.J.

797 Lagarde, J. Influence comparée de l'éthylène chlorhydrine et de la gibberelline sur l'évolution des germes de pomme de terre (variété Bintje). [**Comparative effect of ethylene chlorhydrin and gibberellin on sprouting of the potato variety Bintje.**] *C.R. Acad. Sci., Paris* 1959, **248,** No. 4, 582–5, bibl. 2.

Treatment with ethylene chlorhydrin and gibberellin shortened the dormancy period of potato tubers and caused them to sprout earlier than the controls ; also, the time at which apical dominance disappeared was hastened, especially by gibberellin treatment, resulting in marked acceleration of sprout growth.—E.B.O.

798 Banks, W. and Greenwood, C. T. **The starch of the tuber and shoots of the sprouting potato.** *Biochem. J.* 1959, **73,** No. 2, 237–41, bibl. 24. [Dep. Chem., Edinb. Univ.]

Starch was isolated from the shoots and tubers of sprouting potatoes (var. Home Guard) and its physical and chemical properties were compared with those of starch from tubers sampled immediately after harvesting. The 2 isolates were similar, but that from the shoots had a lower iodine affinity and smaller granules. The amylose fractions separated from the different starches varied with regard to molecular size and β-amylolysis limit, but the amylopectin fractions were similar. F. S.—A.M.H.

799 Bodlaender, K. B. A. De invloed van zwakke lichtintensiteiten op de daglengtereactie van de aardappel. **The influence of low light intensities on the photoperiodic reaction of the potato.** *Jaarb. Inst. Biol. Scheik. Onderz. LandbGew. 1959* 1959, **83–92,** bibl. 4, illus., English summary.

Late potatoes, var. Alpha or Gineke, were grown under 10-hr. daylength followed by a dark period or by 8-hr. supplementary illumination ranging from 5 to 100 lux in intensity. A clear photoperiodic reaction occurred at light intensities of 5–10 lux, and a complete change from short-day to long-day characteristics occurred at 40–50 lux. Variety, temperature (12 or 18°C) and source of artificial light (filament or fluorescent lamps) had little or no effect on photoperiodic sensitivity. Measurements of light intensity during twilight indicated that a period of 30 min. before sunrise and 30 min. after sunset in winter, or 40 min. in each case in summer, should be included in daylength calculations for potatoes.—R.B.

800 Ward, G. M. **Potassium in plant metabolism. 2. Effect of potassium upon the carbohydrate and mineral composition of potato plants.** *Canad. J. Pl. Sci.* 1959, **39,** No. 2, 246–52, bibl. 19. [Can. Dep. Agric., Ottawa, Ontario]

Green Mountain potatoes were grown in sand nutrient culture at 7 levels of K ranging from 0 to 10 m.eq./l. Increases in K increased vegetative growth and the number and size of tubers, decreased the content of Mg and to some extent that of Ca in leaf and stem tissue, and decreased the Fe content of stems and roots and the Cu content of roots. The percentage of starch in leaf tissue increased, and that in stem tissue decreased, with increasing K applications. The level of K had no effect on the distribution of Mn or P in the plant, or on the chemical composition of tubers.—R.B.

801 Gericke, S. Mineralstoffe in der Kartoffel. [**Mineral substances in potato.**] *Kartoffelbau* 1959, **10,** No. 8, 164–5, bibl. 3.

802 Fischnich, O. Die Inhaltsstoffe der Kartoffel und ihr Nutzungswert für die menschliche Ernährung. [**The contents of the potato and its value in human nutrition.**] *Kartoffelbau* 1959, **8,** No. 10, 161–2. [Inst. PflBau u. Saatguterzeugung, FAL Braunschweig-Völkenrode, W. Germany]

803 Hölzl, J. and Bancher, E. Über Vorkommen und Sortenabhängigkeit der Eiweisskristalle in der Kartoffelknolle. [**Occurrence of**

**protein crystals in the potato tuber and their dependence on variety.**] *Bodenkultur* 1959, **10**, No. 2, 110–15, bibl. 8, illus. [Bot. Inst., Technische Hochschule Wien VI, Getreide Markt, 9, Austria]

Cubic protein crystals were clearly observed in potatoes after they had been boiled. The crystals were most frequent in cells of the peripheral layers, e.g. immediately beneath the phellogen, and their size increased towards the interior of the tubers as far as the vascular ring, beyond which they ceased to occur. Varieties differed in the frequency of occurrence of the crystals and their size. In Siegelinde the crystals extended even to the cells of the pith. The crystals are considered to be protein reserves.—D.B.

804 Simpson, K. and others. **Effect of rate of application of superphosphate on growth and yield of potatoes.** *J. Sci. Fd Agric.* 1959, **10**, No. 11, 588–96, bibl. 23.

The effect of rates of application of superphosphate ranging from 0 to 4 cwt. $P_2O_5$/ac. on the yield and growth of potatoes was studied in a very wet season (1954) and a dry one ('55). Although shoot yield was increased by dressings up to 2 cwt. of $P_2O_5$/ac. on soils low in P, yields of root and tuber dry matter were not further increased by applying more than 0·66 cwt. of $P_2O_5$/ac. On soils high in P the application of superphosphate had little effect on shoot yield, but delayed tuber development and depressed the final yield of tuber dry matter. The ratio of ware to seed tubers was highest in 1955. There was a positive correlation between P uptake and yield of tuber dry matter on soils low in P and a negative one on soils high in P. It is suggested that P toxicity occurs when the level of uptake exceeds 35–40 lb. of $P_2O_5$/ac. in plants at 12-wk old, resulting in delayed tuber development and reduction in final yields. The optimum $P_2O_5$ uptake by the whole plant for tuber yield appears to be 30–35 lb. $P_2O_5$/ac. F. s.—S.M.J.

805 Scholler, C. and others. Teneurs en acide ascorbique de tubercules de pomme de terre récoltés sur des parcelles ayant reçu divers traitements de fertilisation. [**Ascorbic-acid contents in potato tubers from plots subjected to different manurial treatments.**] *C. R. Acad. Agric. Fr.* 1959, **45**, No. 11, 533–7, bibl. 13.

Determinations were made of the ascorbic-acid contents in potato tubers during the first 2 weeks, and again about 2 months after harvest. The tubers were produced in 2 series of trials at Grasse and Toulouse, where the experimental plots had been subjected to different manurial treatments for 12 years. Results (tabulated) showed that the ascorbic-acid contents decreased considerably during storage but that they were similar in the 2 series of trials. Some differences observed resulted from considerable differences in ascorbic-acid content between tubers of a same lot.—E.B.O.

806 Lampe, K. Über die Widerstandsfähigkeit von Kartoffelknollen gegen Beschädigungen vor und während der Ernte. [**Resistance of potato tubers to damage both before and during harvesting.**] *Landbauforsch. Völkenrode* 1959, **9**, No. 2, 38–46, bibl. 3, illus. [Inst. Landbauforschung Völkenrode, Braunschweig/Völkenrode, W. Germany]

An instrument for measuring the sensitivity of potato tubers to mechanical damage is described and illustrated. It works on the principle of the sliding-weight balance. Results of tests with this instrument showed that : early removal of the tops enhanced susceptibility of the tubers to damage ; shallow planting and field drying of tubers under good climatic conditions each increased resistance to damage ; there were marked varietal differences in susceptibility to bruising.—D.B.

807 Green, H. C. **Some experiments on the storage of washed and damaged potatoes.** *J. agric. Engng Res.* 1959, **4**, No. 3, 255–9, illus.

It was shown that successful storage of potatoes was more dependent on the absence of damage than on whether they had been washed. Undamaged washed potatoes could be successfully stored in paper sacks providing they had been rapidly dried, all the tubers were sound and stocks were subjected to monthly inspection.—S.M.J.

808 Schupbach, H. Das Beluften von Kartoffellagern. [**The forced ventilation of potato storage houses.**] *Schweiz. landw. MH.* 1959, **37**, No. 6, 347–55, illus. [Eidg. Alkoholverwaltung, Bern]

The forced ventilation of specially built potato storage barns and of accessory indoor and outdoor storage places is dealt with. Devices for regulating temperature at 2·5 – 3·5°C are mentioned.—D.B.

809 Tropical Agriculturist. [**Potatoes in Ceylon.**] *Trop. Agriculturist* 1958, **114**, No. 2, 73–139, bibl., illus.

The principal articles published in this number, devoted entirely to potatoes in Ceylon, are : Report of Dr. Pushkarnath on his visit to Ceylon in connexion with assessing the possibilities and prospects of potato culture ; Cultivation of potatoes in Ceylon, by A. V. Richards ; Experiments on the fungicidal control of late blight (*Phytophthora infestans*) of potato, by D. V. W. Abeygunawardena and J. W. L. Peiris ; Response of potato to fertilizers, manure, lime and trace elements, by F. N. Ponnamperuma ; Variety and cultural trials with potato, by D. V. Ariyanayagam ; and Investigations on potato insects and their control with special reference to *Dorylus orientalis*.—E.B.O.

## SWEET-POTATOES

810 Purewal, S. S. and Dargan, K. S. **Effect of sowing dates, fertilizers and spacings on development and yield of sweet potato (*Ipomoea batatas*).** *Indian J. Agron.* 1959, **3**, No. 3, 164–71, bibl. 12. [Govt Agric. Coll., Ludhiana]

The planting dates were 15 and 30 June and 15 July ; spacing between rows was 1, 2 and 3 ft and plant spacing in the rows was 1 ft. Fertilizer was applied just before transplanting as follows : 0 or 50 lb. N as $(NH_4)_2SO_4$, 0 or 50 lb. $K_2O$ as $K_2SO_4$, and 0 or 50 lb. $P_2O_5$ as phosphate. Observations on growth and yield were made at harvest early in December. Early planting, wide row-spacing and 50 lb. N (but not P or K) significantly increased the weight and length of vines and the number of shoots. Wide spacing (2 and 3 ft) and 50 lb. N (but not $P_2O_5$ or $K_2O$) significantly increased the weight of tubers per plant, but yield per acre was greater under close row-spacing (1 and 2 ft) than wide row-spacing (3 ft). Of planting dates, the first gave the highest tuber yield per plant and per acre.—D.B.

811 Institut National pour l'Étude Agronomique du Congo Belge. [**Sweet-potatoes.**] *Rep. INÉAC 1958*, 1959, 441, 469, 478, 502 and 511.

At Ndihira, northern Kivu, the sweet-potato var. M. 46 yielded 15,410 kg fresh tubers/ha when planted on 14 June and 10,000 kg when planted on 15 Jan. At Mont Hawa the var. C.S.K. 17, recently introduced from Keyberg, yielded 30,000 kg fresh tubers/ha, against 16,000 kg from the local variety. At Rubona, Ruanda Urundi, the average yield of fresh tubers was 23,537 kg/ha when a plant spacing of 80 × 30 cm or 50 × 30 cm was used, against 13,700 kg when the spacing was 100 × 30 cm. At Mosso the var. Carolina Lee and Algérienne yielded 15,040 and 11,250 kg fresh tubers/ha, respectively, and are being distributed to farmers. At Rwerere, N. Ruanda, in multiplication plots the var. Mugenda, Norton Sam and 3013–73 yielded 34,000, 25,000 and 13,000 kg fresh tubers/ha, respectively.—E.B.O.

812 Wang, H. **Regional trial of table-used varieties of sweet potatoes.** [Chinese] *J. agric. Assoc. China* 1959, No. 25 (n.s.), 52–63, bibl. 9, English summary. [Chiayi Agric. Exp. Sta., Tari]

The adaptability of 5 new table varieties (C 381, 382, 430, 454 and 456) of *Ipomoea batatas* to the central and southern provinces of Formosa was tested during 3 years in 8 places ; local and American varieties were used as standards. The 5 varieties were of the short-vine type, suitable for interplanting with other crops. Records were made of nutrient content (including vitamins), percentage of chips, percentage of dehydrates [dry matter], morphological features, flesh colour and taste. C 454 produced significantly higher yields of tubers than did the other new varieties ; it had the best flavour and, together with C 381 and 382, had the highest vitamin A content (several times higher than that of the local varieties). Flesh colour deepened with vitamin A content. C 454 is adapted to central and southern regions of Formosa and can stand wet conditions and early planting. The best of the new varieties C 381, 382 and 454 have been renamed Tainung No. 54, No. 55, and No. 57 respectively. F. Eng. s.—D.B.

813 Lam, S. L. **Induction of flowering in the sweet potato (*Ipomoea batatas* Lam.)** *Diss. Abstr.* 1959, **19**, No. 11, 2708–9. [Univ. Illinois, Urbana]

The results of trials in which plants of *I. batatas* were grafted on to morning glory [*Ipomoea* sp.] plants showed that a substance was produced in the leaves of the morning glory plants which was translocated to the meristems of the sweet potato plants, where it produced morphogenic effects. Movement of this substance within the plants was non-polar, was not affected by the presence of leaves on the receptor plant and was not destroyed by light. There were considerable differences between *Ipomoea* donor species in their ability to induce flowering in *I. batatas*. Observations are made on the effect of photoperiod and temperature on floral initiation in *Ipomoea* spp. It was concluded that by appropriate choice of donor species, temperature and photoperiod, any variety of *I. batatas* could be induced to flower at any time of the year.—P.J.B.

## CASSAVA

*See also Abs. 973*

814 Stehle, H. La culture du manioc et ses possibilités industrielles aux Antilles françaises. [**The cultivation and industrial possibilities of cassava in the French Antilles.**] *Riz et Rizicult.* 1959, **5**, No. 4, 188–92, illus., English and Spanish summaries.

815 Department of Agriculture, Federation of Nigeria. [**Experiments with cassava.**] *Rep. Dep. Agric. Res. Fed. Nigeria 1957-8* Lagos, 1959, 17, 35.

In a series of varietal trials at 8 centres in the Western Region, the variety 53101 gave the best average yield, but had no advantage over the local varieties at stations east of Akure. Cassava mosaic virus infecting var. B9 was inactivated by growing cuttings at temperatures of 37°C or 39°C for periods of 4–6 weeks. More reliable results were obtained by excising young green shoots from the

parent cutting after heat treatment and rooting them separately.—J.D.J.

816 Institut National pour l'Étude Agronomique du Congo Belge. [**Cassava.**] *Rep. INÉAC 1958*, 1959, 206–7, 246, 252–3, 345, 355, 370 and 478.

In comparative trials at Mvuazi, the cassava clone 02864 yielded best (36,880 kg fresh roots/ha). On medium soil, 02864 harvested after 12 months' growth yielded 14,625 kg, while on new alluvial soil it yielded 43,458 kg after 18 months. At Vuamba, Kwango, the varieties Matuluku and Masodi Sali yielded 19,000 and 17,500 kg/ha, against 13,800 kg from the local variety. At Bena Longo, Kasai, the best varieties, M 11, M 7 and M 9 yielded an average of 17,157, 16,719 and 15,329 kg fresh roots/ha, respectively. At Magombo, Niangara, the variety Gbazamangi 21 B from Bambesa gave the highest yield, 28,640 kg fresh roots/ha. The best clone at Gandajika was S 097 (37,600 and 32,500 kg fresh roots/ha). At Lubarika the variety S–0 3119–136, which was better than the control Amer de six mois, is being multiplied, while Eala amer 07 is being multiplied at Rubona.—E.B.O.

817 Normanha, E. S. Ácido 4 – cloro-2-metilfenoxibutírico (MCPB), como hormônio estimulante do enraizamento. [**MCPB, a hormone which stimulates rooting.**] *Bragantia* 1958, **17,** Note 8, 41–4, illus., English summary. [Received Aug., 1959]

Preliminary trials with cassava (*Manihot utilissima*) cuttings confirmed that MCPB stimulates root formation. F. s.—E.B.O.

818 Thomas, Jacqueline M. C. Notes d'ethnobotanique africaine : plantes utilisées dans la région de la Lobaye (Afrique Centrale). [**Notes on ethno-botany in Africa : plants used in the region of Lobaye (Central Africa).**] *J. Agric. trop. et Bot. appl.* 1959, **6,** No. 8–9, 353–90, bibl. 36.

Cassava (*Manihot utilissima*) is among the species considered.—E.B.O.

## YAMS

*See also Abs. 954*

819 Department of Agriculture, Federation of Nigeria. [**Yams.**] *Rep. Dep. Agric. Res. Fed. Nigeria 1957-8* Lagos, 1959, 18, 30.

The seeds of *Dioscorea dumetorum* and *D. rotundata* at harvest contained a rudimentary embryo, and at least 3 months' storage under dry conditions was required for the embryo to mature. Aldrin 2·5% dust and chlordane 5% dust applied to yam setts before planting to control *Heteroligus* spp. increased yields by 26% and 20%, respectively, as compared with 11% with 0·45% gamma BHC dust.—J.D.J.

## COCOYAMS

*See also Abs. 954*

820 Barrau, J. Fruits et graines du taro, *Colocasia esculenta* (Linné) Schott. [**Fruits and seeds of cocoyam (*C. esculenta*).**] *J. Agric. trop. et Bot. appl.* 1959, **6,** No. 8–9, 436–8, bibl. 4, illus.

It is generally believed that *C. esculenta* rarely bears fertile seeds. During a mission to New Guinea, in 1958, the author collected fruits and fertile seeds from a semi-wild population of *C. esculenta* growing near Lae, Morobé district. These seeds were sent to New Zealand where they germinated. [See also *Fld Crop Abstr.* 11 : 275.]—E.B.O.

# FIBRE CROPS

## COTTON

*See also Abs. 627, 903, 921, 924, 1020*

821 Dastur, R. H. and Mathur, J. M. **Investigations into the possibilities of growing American cottons in the Mewar tract of Rajasthan.** *Indian Cott. Gr. Rev.* 1959, **13,** No. 2, 83–95. [Scheme for Cotton Physiol. Res., Indore]

Results are given of the effect of sowing date, spacing and irrigation on yields of American (medium-staple) cotton in this area. When sown during the rains the yields of American cottons (Indore 1, Buri 107 and C.A.9) were higher than the local desi [unimproved] variety, but when sown before the rains (12 June), in places where there were facilities for irrigation, the yield increase above the local desi variety was higher still. A spacing of 1 sq. ft gave higher yields than one of 1·5 or 2 sq. ft. Irrigation, before sowing or after the monsoon according to conditions, increased cotton yields at most stations and the increase was sufficient to allow a considerable profit. Contrary to local opinion, varieties of American cotton yielded as well as or better than the local variety.—D.B.

822 Singh, G. and Singh, K. **Optimum sowing time of American cotton in the Punjab.** *Indian Cott. Gr. Rev.* 1959, **13,** No. 2, 116–19, bibl. 4.

At each of 3 stations representative of the cotton-growing areas of the Punjab, early sowing gave significantly higher yields of American cotton than did late sowing. The optimum sowing periods were at : Abohar, the whole of May ; Hansi, mid April to mid May ; Jullundur, 2nd week of April to 1st week of May. Cotton sown early responded better to N (as $(NH_4)_2SO_4$), the response to N being greater in the dry than in the more humid area (Jullundur). In each area a close

spacing 2 × 1 ft gave significantly higher yields than a spacing of 2 × 2 ft. The difference in yield obtained from these spacings increased as sowing was delayed from end of April to early June.—D.B.

823 Vizgin, V. [**Crop rotations for irrigated cotton.**] [Russian] *Hlopkovodstvo* (*Cott. Prod.*) 1959, **9**, No. 11, 7–11.

There is a discussion of the system of crop rotation as applied to the cotton areas in Soviet Central Asia in the light of Malickiĭ's proposition [*Fld Crop Abstr.* 12 : 1908].—M.H.

824 Rešetnikov, F. [**Problems of the herbage/green manure system of agriculture for irrigated cotton.**] [Russian] *Hlopkovodstvo* (*Cott. Prod.*) 1959, **9**, No. 11, 3–6. [Uzbek Sci. Res. Inst. Mech. Elect. Irrig. Agric.]

Information is supplied on the system of crop rotation in the Uzbekistan cotton area, with special reference to the work of Malickiĭ [*Fld Crop Abstr.* 12 : 1908].—M.H.

825 Petrov, E. G. and Preobraženskaja, M. V. [**The water/salt regime of soils when cotton is irrigated by sprinkling after water-storage irrigation during autumn and winter on the State farm " Pahta-Aral ".**] [Russian] *Doklady Vsesojuz. Akad. S-H Nauk* (*Proc. Lenin Acad. Agric. Sci.*) 1959, **24**, No. 10, 43–8. [All-Union Sci. Res. Inst. Hydrotech.]

826 Coyaud, Y. L'assolement coton-riz sur les terres irriguées du Delta Central Nigerien. [**The cotton/rice rotation of the irrigated areas of the Central Nigerian Delta.**] *W. Afr. Cotton Res. Conf., Samaru, N. Nigeria 1957*, [n.d.], 46–9, English summary.

A cotton/rice rotation is advocated for cotton soils in Nigeria. Advantages of cultivation, weed control and more economic use of available labour compared with previous rotations which included groundnuts or fallow, are described.—S.M.J.

827 Demol, J. and Bannink, L. Évolution des méthodes culturales dans la région cotonnière nord du Congo Belge. [**The evolution of cultural methods in the cotton-growing area north of the Belgian Congo.**] *W. Afr. Cotton Res. Conf., Samaru, N. Nigeria 1957*, [n.d.], 58–68, bibl. 11, English summary.

828 Institut National pour l'Étude Agronomique du Congo Belge. [**Cotton.**] *Rep. INÉAC 1958*, 1959, 299, 313–14, 317, 329, 341, 348–9, 369 and 502.

At Bambesa the cotton var. Bambesa 49 yielded more than Stoneville 5 (1218 kg seed cotton/ha on normal soil, and 757 kg on poor soil, against 916 and 681 kg from Stoneville 5, respectively). On about 7800 ha treated with 16·2 kg of a dust containing 15% toxaphene/ha, the number of *Helopeltis schoutedeni* was reduced from 27 to 2·7 per 1000 plants. *Hemitarsonemus latus* was controlled on 2500 ha by treatment with a dust containing 10% toxaphene and 5% DDT. *Sclerotium rolfsii* was satisfactorily controlled by treating the seeds with a preparation containing 75% PCNB. At Boketa, Ubangi, sowing in early July gave considerably higher yields than sowing in early Aug. In a trial at Magombo, Niangara, the var. Lubarika 1021, sown on 19 June, was best and yielded 713 kg seed cotton/ha. The variety C 2 yielded best at Mosso and is being distributed in the centre of Kabula-Peshi-Esanga and in the valley of Lomami-Lukashi. At Lubarika the variety 1021·849 yielded best when grown at a spacing of 150 × 30 cm (2954 kg seed cotton/ha).—E.B.O.

829 Gutknecht, J. Aperçu sur la sélection de variétés de coton au Tchad. [**Observations on the selection of cotton varieties for Tchad.**] *W. Afr. Cotton Res. Conf., Samaru, N. Nigeria 1957*, [n.d.], 88–97, English summary.

Allen 150 and Allen 151, varieties of cotton which have been produced for use in the Tchad and N. Cameroons cotton-growing areas have a 37% ginning percentage and are expected to increase fibre production in these areas by 40%. Both varieties are resistant to *Xanthomonas malvacearum*, *Fusarium* and to jassids [*Empoasca* sp.]. F. Eng. s.—S.M.J.

830 Ayyangar, G. S. et al. **Chinnapathi improvement work — Past, present and future.** *Indian Cott. Gr. Rev.* 1959, **13**, No. 1, 39–43, bibl. 1. [Dep. Agric., Andhra State]

An account is given of the distribution, cultivation, botanical characteristics and improvement of this short, coarse, white-linted type of cotton (*Gossypium arboreum* race *indica*) grown in Srikakulam and Visakhapatnam districts of Andhra State.—D.B.

831 Gutiérrez, M. and others. Ensayos comparativos de variedades de algodón en áreas con " marchitez". Año agrícola 1957–58. [**Comparative trials with cotton varieties in areas affected by damping-off (in Argentina). 1957-8.**] *Idia* 1959, No. 137, 24–32, bibl. 5. [Esta. Exp. Agropec. Presid. Roque Sáenz Peña]

In plot trials with cotton varieties in Argentina, mainly in the province of Chaco, in areas affected by damping-off (caused by *Fusarium vasinfectum* and various root nematodes), the best yields were obtained from the varieties Sáenz Peña M 58, Coker 100 Wilt BR (1956) and Dixie King, all resistant to damping-off.—E.B.O.

832 Sergueff, M. Organismes chargés de la conservation de la qualité des semences du cotonnier en U.R.S.S. [**Organizations in charge of the conservation of cotton-seed quality in the USSR.**] *Cot. et Fibr. trop.* 1959, **14**, No. 1, 61–77, bibl. 4, English summary.

833 Bazán, S. Consuelo. Efecto de la acción fungicida del pentacloronitrobenceno en la semilla de algodonero almacenada. [**Fungicidal effect of pentachloronitrobenzene on stored cotton seed.**] *Bol. trim. Exp. agropec., Lima* 1959, **8**, No. 1, 2–4. [Esta. Exp. Agríc., La Molina, Peru]

In the trial described, cotton seed was treated with PCNB 75%, at 300 g/100 kg of seed, for the control of *Rhizoctonia solani*, 1, 15, 30 or 45 days before sowing. Results from germination tests showed no significant differences in the numbers of plants grown from seeds stored for different periods, while the number of plants from untreated seed was significantly lower.—E.B.O.

834 Sinclair, J. B. and others. **Field screening of various fungicides for control of cotton seedling damping-off.** *Pl. Dis. Rptr* 1958, **42**, No. 12, 1372–5, bibl. 10. [Louisiana Agric. Exp. Sta., Baton Rouge]

In 1957 and 1958, 7 tests were conducted at 5 localities to control damping-off of cotton seedlings caused mainly by *Rhizoctonia solani*. Results were judged by the numbers of seedlings established. Best control was obtained with captan at 2·5 lb./ac. plus zineb or PCNB at 2·5 lb./ac., or all 3 together, each at 1·7 lb./ac. At one location plant population was increased nearly threefold.—J.D.J.

835 Tarr, S. A. J. **Crop protection by seed treatment. 1. Seed dressings for cotton.** *World Crops* 1959, **11**, No. 11, 401–2, bibl. 10, illus.

The use of abavit (8·5% Hg), MEMA, ϒBHC, thimet, di-syston and schradan as seed dressings for cotton in the Sudan, USA and Brazil are discussed. See also *Abs.* 637.—S.M.J.

836 Planes, G. S. El gusano rosado del algodonero. [**Pink bollworm of cotton.**] *Agricultura, Madr.* 1959, **28**, No. 327, 381–5, illus. [Inst. Nac. Invest. Agron., Madrid]

Pink bollworm (*Platyedra gossypiella*) is a serious pest of cotton in Spain, where this crop is grown on about 250,000 ha, and trials have been carried out there to control it. Cotton seed should be fumigated with methyl bromide. For treatment in the field, dusting with endrin 1·5% + DDT 7·5% + HCH [BHC] 10%, or endrin 1·5% + DDT 8%, is recommended. This treatment should be applied when the first bolls are formed and should be repeated 5–6 times at 10 to 15 day intervals. The quantity of product applied is 25–30 kg/ha per treatment. —E.B.O.

837 Coaker, T. H. **Crop loss by insect pests in Uganda.** *W. Afr. Cotton Res. Conf., Samaru, N. Nigeria 1957*, [n.d.], 113–5.

Because of natural physiological shedding of cotton bolls, attack by *Lygus vosseleri* and *Heliothis armigera* early in the growing season results in only small yield losses. It is considered that insecticides can only be applied profitably when insect damage has gone beyond the point at which recovery by the plant is impossible and yield losses will occur. It is recommended that insecticides should be used against attacks of bollworm which occur late in the growing season.—S.M.J.

838 Joyce, R. J. V. **The yield response of cotton in the Sudan Gezira to DDT spray.** *Bull. ent. Res.* 1959, **50**, No. 3, 567–94, bibl. 6. [Res. Div., Minist. Agric., Wad Medani, Sudan]

In the Gezira, Egyptian cotton (*Gossypium barbadense*) is sprayed with DDT, 6–10 weeks after sowing, for control of the cotton jassid (*Empoasca lybica*). The yield response of cotton to DDT spray was shown to vary from season to season ; a highly significant part of this variance was correlated with rainfall in July about 6 weeks before the crop was sown. A series of experiments in 1956–7 showed that Domains Sakel cotton, which is grown in the drier, northern part of the Gezira, gave an increased response to DDT spray with higher levels of N fertilizer, and that a very highly significant part of this response was due to the control of jassid and thrips (*Caliothrips* spp.). X1730A, grown in the wetter, southern part of the Gezira, gave no overall response to spraying, nor was its response to N fertilizer affected by spraying. It is concluded that at least half of the deleterious effect of poor pre-sowing rains on cotton yields in Gezira is in fact a pest effect which can be eliminated by spraying with DDT. F. S.—E.B.O.

839 Choyce, M. A. **Insecticide trials on cotton in Northern Nigeria.** *W. Afr. Cotton Res. Conf., Samaru, N. Nigeria 1957*, [n.d.], 118–26, bibl. 4.

In insecticide trials with cotton at Kontagora during 1956–7, plots sown in June and treated with 2 lb. DDT + 0·6 lb. ϒBHC/ac. as emulsion applied at 54 gal./ac. against cotton stainer (*Dysdercus* sp.) resulted in yields of 1483 lb. seed cotton/ac., compared with 455 lb. from unsprayed plots. With sowing dates later than June yields of treated and untreated cotton dropped progressively. At Samaru and Daudawa it was considered that insecticides should be applied only where the yield potential of cotton could be increased.—S.M.J.

840 Good, J. M. and Steele, A. E. **Control of sting nematodes for two growing seasons by soil fumigation.** *Pl. Dis. Rptr* 1958, **42**, No. 12, 1364-7, bibl. 9, illus. [U.S. Dep. Agric., Tifton, Georgia]

Sting nematodes (*Belonolaimus* spp.) have a wide host range and are associated with fusarium wilt in causing a severe disease complex of cotton.

DBCP (95% 1,2-dibromo-3-chloropropane) at 0·9 U.S. gal./ac. controlled nematodes completely in 1956 and cotton yields were increased to a level 7 or 8 times those from untreated plots. During the following year the nematode population on treated plots remained at 35% of that of the control and maize yields were 75% greater. EDB (41% ethylene dibromide) at 9·5 U.S. gal./ac. gave comparable results in the first year, but was almost ineffective in the second year. DCP–EDB mixture (55·2% 1,3-dichloropropene + 24·8% of 83% EDB) at 8 U.S. gal./ac. and DD mixture (equal amounts of 1,3-dichloropropene and 1,2-dichloropropane) at 9·5 U.S. gal./ac. increased cotton yields to 4–5 times those of untreated controls, but otherwise their effect was transitory.—J.D.J.

841 Lord, E. and Anthony, K. R. M. **Effect of exposure to the Aden climate on cotton lint strength.** *Emp. Cott. Gr. Rev.* 1960, **37,** No. 1, 10–14, bibl. 4.

Treatments were devised to measure the effect on cotton fibre strength of varying degrees of exposure to sun, wind and rain at harvest (Jan.–April), and in the summer (June-Sept.). Loss of strength in freely exposed material approached 1% per week in the harvest period, and 2% per week in the summer.—J.D.J.

842 Ramachandran, C. K. and others. **Variation in the seed and fibre characters of cotton due to environment.** *Indian Cott. Gr. Rev.* 1959, **13,** No. 1, 31–8, bibl. 6. [Agric. Dep., Madras]

Variations were recorded in the fibre and seed characters of 6 varieties of cotton raised as an irrigated summer crop in 2 environmentally different areas in Madras State, viz. Palur in S. Arcot district (sandy loam) and Srivilliputtur in Ramanathapuram district (clay loam). The climatic factors which influence crop growth in these 2 areas are tabulated. Environmental conditions at Palur were responsible for a significantly lower halo length and significantly higher seed weight per 100 seeds, lint weight per 100 seeds, and ginning percentage than were recorded at Srivilliputtur. The difference in mean fibre-weight (oz./in.) of seed produced in these 2 localities was not significant.—D.B.

843 Johansson, T. S. K. **Tracking honey bees in cotton fields with fluorescent pigments.** *J. econ. Ent.* 1959, **52,** No. 4, 572–7, bibl. 14, illus. [Arizona Agric. Exp. Sta., Tucson]

Fluorescent pigments placed in the flower corollas of Pima S-1 and Pima 32 cotton plants growing as a mixed stand were transferred by bees to other flowers in the stand. Flowers of each variety were present in approximately equal numbers. Pigment placed in flowers of Pima 32 was distributed equally between flowers of both varieties, but pigment placed in flowers of Pima S-1 was distributed 2 to 3 times as frequently to flowers of Pima S-1 as to those of Pima 32.—R.B.

844 Iyengar, R. L. N. **An instrument for the determination of the toughness of the veins of cotton leaves.** *Indian Cott. Gr. Rev.* 1959, **13,** No. 4, 280–3, bibl. 3, illus. [Tech. Lab., Indian Centr. Cott. Cttee, Matunga]

The construction and functioning of the instrument are described and illustrated, and some preliminary results are given. The instrument was originally designed to assist in the breeding of cotton varieties resistant to attack by jassids [*Empoasca devastans*].—D.B.

845 King, H. E. and Lawes, D. A. **A rapid method for estimating leaf area in cotton.**. *W. Afr. Cotton Res. Conf., Samaru, N. Nigeria 1957.* [n.d.] 205, bibl. 3.

A method for estimating the leaf area in cotton is described, in which the length of the midrib from pulvinus to extreme tip is measured and the value obtained is squared and then multiplied by an appropriate factor. This factor is a constant for any one variety in any one area.—S.M.J.

846 Mello, F. A. F. and Brasil, M. O. C. Cálcio e magnésio em fôlhas de algodoeiro. [**Ca and Mg in cotton leaves.**] *Rev. Agric., Piracicabà* 1959, **34,** No. 4, 257–61, bibl. 4, English summary.

Determinations were made of the Ca and Mg contents in leaves of cotton (*Gossypium hirsutum*) var. I.A.C. 817. The Ca content was higher in mature leaves grown from stems than in those from productive branches. With Mg the results were not consistent. The Mg content of leaves was higher at the beginning of boll formation than in early flowering.—E.B.O.

847 Malkani, T. J. and Asana, R. D. **Effect of growth regulators on boll-setting and yield of the Punjab-American cotton, 216F.** *Indian J. Pl. Physiol.* 1958, **1,** 58–70, bibl. 7. [Indian Agric. Res. Inst., New Delhi]

For cotton production, the most successful treatment with growth-regulating substances consisted of 1 spraying with NOA at 5 ppm combined with a wetting agent, or NAA, IAA or IBA at 40 ppm (20 ppm if combined with a wetting agent). The best time for spraying was after the opening of the first flower. These growth-regulating substances increased the number of bolls and significantly increased the yield of seed cotton by an average of 400 lb./ac. Fibre quality was not adversely affected.—D.B.

848 Homès, J. Contribution à l'étude histologique de la greffe de *Gossypium hirsutum*. [**Contribution to the histological study of grafting in *G. hirsutum*.**] *C. R. Soc. Biol., Paris* 1958, **152**, No. 7, 1205–8. [Univ. Bruxelles]

849 Singh, G. and Singh, K. **Studies on manurial requirement of American cotton in Punjab.** *Indian Cott. Gr. Rev.* 1959, **13**, No. 3, 161–3, bibl. 2. [Abohar, Hansi, and Jullundur, Punjab]

Judging by yields of seed cotton and cost of fertilizer, $(NH_4)_2SO_4$ was the most efficient source of N for cotton grown under irrigated conditions in the Punjab. $(NH_4)_2SO_4$ was followed, in this order, by urea, $NaNO_3$, and groundnut cake. The residual effect of 50 and 100 lb. N was sufficient to increase the grain yield of a subsequent wheat crop by 123 and 272 lb./ac. (20 and 43%) respectively. —D.B.

850 Samuels, G. and others. **The response of cotton to fertilizers in Puerto Rico.** *J. Agric. Univ. P.R.* 1959, **43**, No. 2, 89–102, bibl. 11. [Univ. P.R. Agric. Exp. Sta., Río Piedras]

Sea Island cotton was grown on 4 soil types receiving various levels of N, P and K treatment. Yields were increased by N on 2 soils and by P and K on 1 soil. The mineral content of leaf blade tissue, collected 45 days after sowing, showed greater differences between treatments than did that of petiole tissue or that of leaf blade tissue collected at a later stage. Where the N, P and K contents of leaf blade tissue were greater than 5, 0·4 and 3·2%, respectively, no increase in yield could be expected from top-dressing. F. s.—R.B.

851 Barberton Agricultural Research Station, S. Africa. [**Experiments with cotton.**] *Rep. Agron. Exp. Barberton Agric. Res. Sta. 1956–7*, [n.d.], 1–20.

The standard variety of cotton in general cultivation is Muka A7215, but Muka A860 has been shown to be potentially the better variety. Other leading varieties are Umu A456 and Kapel A2106. However, the average farmer realises only one-third of his potential crop and there is much greater need for better farming practices than for higher yielding varieties. Rates of 80 lb. N, 80 lb. P and 120 lb. K/morgen [1 morgen = 2.117 ac.] applied to red loam, or PK at 80 lb. P and 120 lb. K/morgen applied to granite soil, approximately doubled yields of lint and improved fibre quality. Fertilizer gave best results when placed 4–6 in. deep. Consistently high yields of cotton have been obtained for 5 seasons with NPK fertilizer on continuous cotton. The transitory effects of green manuring and leys do not compensate for the interruption in cropping, nor is the income from the ley likely to do so.—J.D.J.

852 Salim, H. **Cotton experiments at Deir Alla Research Station, 1951-1958.** Jordan, [n.d.], pp. 25 (mimeo), bibl. 8.

An account is given of experiments on cotton-growing in Jordan. The tests included a study of varieties, fertilizers, methods of sowing and of pest control. The spring boll worm (*Earias insulana*) is a limiting factor to the production of cotton in the Jordan Valley. The work on cotton has now been discontinued.—M.H.

853 Sattar, A. **Cottons of the world. Ch. 7. North America. Ch. 8. South America.** *Pakistan Cotts.* 1959, **4**, No. 1, 90–114, illus.

An account and some tabulated data are given of acreages, varieties, production and yield per acre in the cotton-growing regions of USA, Mexico, Nicaragua, the West Indies, Peru, Brazil and Argentina. Maps illustrate the distribution of varieties.—D.B.

## FIBRE FLAX

*See also Abs. 902, 903*

854 Dospehov, B. A. and Leonov, S. A. [**The main results of work on the cultivation of flax.**] [Russian] *Izv. Timirjazevsk. S-H Akad.* (*Bull Timirjazev agric. Acad.*) 1959, No. 4 (29), 85–102, bibl. 80, English summary.

The results are discussed of work at the Timirjazev Agricultural Academy (during 1913–30 and 1949–59) on fibre flax in crop rotations, and the use of fertilizers for this crop. F. s.—M.H.

855 Masuo, Y. and Murakami, J. **Weed control in fibre flax by herbicides. 1. The effect of 2,4-D and MCPA.** [Japanese] *Res. Bull. Hokkaido Nat. Agric. Exp. Sta.* 1959, No. 74, 119–26, bibl. 12, illus., English summary.

As a general weedkiller for flax fields, MCPA, at an a.e. of 300–500 g/ha, should be sprayed (in 900 l water/ha) when the flax is 5–10 cm high. At this stage, MCPA (and 2,4-D) did not depress the growth or the seed- or straw- yield of flax. If applied to flax at a later growth stage, leaf abnormalities, stem curvature and inferior fibre quality occurred. MCPA, applied when flax was 5 cm high, killed most weeds. Resistant weeds were *Polygonum blumei*, *Chenopodium album* and *Commelina communis*. F. Eng. s. —D.B.

856 Momot, Ja. G. [**An instance of proliferation in flax (*Linum* spp.).**] [Russian] *Bot. Ž., SSSR* (*Bot. J., USSR*) 1959, **44**, No. 8, 1141–2, bibl. 11. [Uzbek Agric. Inst., Samarkand]

On irrigated plots of the common variety (Bahmal'skiĭ 1056) of *L. usitatissimum* used for selection work at the above Institute, one plant was found which was completely sterile and formed a dense growth of green branches ; a second plant was partially sterile, one of the branches producing

normal flowers in addition to flowers in which the corolla was composed of 5 separate green petals, curled like normal green leaves, and with clearly defined veining. The author claims that this feature has not been described hitherto for flax, and it is the first instance he has observed during many years' study of flax on both irrigated and non-irrigated areas. A review is given of descriptions by various authors of proliferation in different plants, but the conditions under which this feature is induced are not known.—M.H.

857 Brandenburg, N. R. and Harmond, J. E. **Equilibrium moisture content of fiber flax.** *Tech. Bull. 1200 U.S. Dep. Agric.* 1959, pp. 15, bibl. 17, illus.

The equilibrium moisture contents of unretted flax straw, retted flax straw dried either under field conditions or in a stream of hot air, flax line fibre and flax tow fibre were determined under conditions of adsorption and desorption at 80°F and 9 relative humidities within the range 26–96%. Retted flax straw was similarly tested at 100 and 140°F. When moisture content was plotted against relative humidity, sigmoid curves typical of hygroscopic materials were formed, and hysteresis was shown to occur. Under conditions of adsorption, unretted straw contained most moisture at equilibrium, followed by retted field-dried straw, retted artificially dried straw, tow fibre and line fibre.—R.B.

## JUTE

*See also Abs. 859, 860*

### *HIBISCUS* SPP.

858 Aubry, F. La culture de l'*Hibiscus* en Afrique du Nord. [***Hibiscus* cultivation in North Africa.**] *Cot. et Fibr. trop.* 1959, **14,** No. 1, 1–28, illus., English summary.

After a brief review of the history of the cultivation of fibre plants in Morocco, information is given on the growing of *Hibiscus cannabinus*, a new crop, at the Deroua Pilot Farm of the Comptoir Linier, which covers 415 ha in the Beni-Amir area. An Egyptian variety named teal is mainly grown. Aspects considered are : soil cultivation, sowing, rotation, irrigation, cutting, decortication retting and fibre characteristics. An average of 10 irrigations, each of 1200 $m^3$ of water/ha, are given during Apr.-Sept. The plants are harvested when they are in full flower. Provided that measures are found to control attacks by pests and diseases, yields should be 2500–3000 kg of fibre per ha.—E.B.O.

859 Haarer, A. E. Kenaf ou jute ? L'Inde doit prendre une décision rapide. [**Kenaf or jute? India must make a quick decision.**] *Cot. et Fibr. trop.* 1959, **14,** No. 1, 57–60, English summary.

This is a French version of an article published in *Fibre Industries and Cordage World* 1957, No. 457. Tables show the areas and production of jute and kenaf in India for the past few years. The growing of kenaf, which is more resistant to drought than jute, is on the increase.—E.B.O.

860 Kundu, B. C. and others. **Comparative study of yield performance of the different fibre crops.** *Indian J. Agron.* 1959, **3,** No. 4, 231–6, bibl. 7. [Jute Agric. Res. Inst., Barrackpore, W. Bengal]

*Hibiscus cannabinus* (mesta), *H. sabdariffa* (roselle) and *Crotalaria juncea* (sunnhemp) were compared with *Corchorus olitorius* and *C. capsularia* as regards rate of growth, time of 50% flowering, yield of fibre, and fibre percentage of the green weight. *H. sabdariffa* R.T.2 gave significantly the highest yield of fibre (about 1900 lb./ac.). It was followed by *H. sabdariffa* R.T.1, *C. olitorius* C.G., and *C. capsularia* D 154, which gave yields (about 1650 lb./ac.) significantly superior to those of *H. cannabinus* and *Crotalaria juncea.* 50% flowering occurred in Sept. in mesta and jute, but not until November in roselle. In mesta, quality of fibre is almost as good as in jute ; roselle is inferior to jute in fibre quality.—D.B.

861 Soengkono, —. Sedikit pengalaman tentang pengolahan batang² rosella (*Hibiscus sabdariffa*) setjara mekanis. **Some points regarding the mechanical decortication of *Hibiscus sabdariffa* stems.** *Menara perkebunan* 1959, **28,** No. 5, 91–8, bibl. 3, illus., English summary [N.V. Tani Mulja]

Experimental work on the mechanical decortication of *H. sabdariffa* stems in the field using a Baproma bast-fibre processing machine was carried out in Java in 1957. Ribbons of bark from the machine required only 3–4 days retting compared with 8–14 days where whole stems were retted. [From *Trop. Abstr.* 1959, **14,** No. 9, g2206.]—R.B.

### *URENA LOBATA*

862 Institut National pour l'Étude Agronomique du Congo Belge. [***Urena lobata.***] *Rep. INÉAC 1958*, 1959, 191, 219 and 467.

In crop rotation trials on different types of alluvial soils at Yangambi, *Urena lobata* yielded 908–1708 kg fibre/ha. At Gimbi, *U. lobata* yielded 600–700 kg seed/ha ; dusting young plants (in the cotyledon stage) with HCH [ = BHC] gave effective control of Chrysomelidae. At Mont Hawa *U. lobata* var. S.M. (Gimbi) yielded 770 kg fibre/ha.—E.B.O.

## SUNNHEMP

*See also Abs. 860*

863 Echeverry, E. R. La *Crotalaria juncea* como productora de fibra. [**Sunnhemp (*C.***

*juncea*) **for fibre.**] *Agric. trop., Bogotá* 1959, **15,** No. 6, 356–62, bibl. 4. [Sec. Agropec. Tolima, Minist. Agric. Colombia]

Information is given on growing sunnhemp for seed or for fibre. The characteristics of the fibre and methods for extracting it are described.—E.B.O.

# OIL CROPS

## SESAME

864 KOSTRINSKY, Y. **Methods for increasing the productivity of *Sesamum indicum* L. [in Israel].** [Hebrew] *Bull. 62, Agric. Res. Sta., Beit-Dagan, Israel* 1959, pp. 95, bibl. 24, illus., English summary.

The following aspects are considered : mechanization of sowing and harvesting ; crop rotation ; use of fertilizers ; effect of sowing time on yields and oil content ; varieties ; seed quality and irrigation.—M.H.

865 VORONJUK, B. A. **[A variety of *Sesamum indicum* with only slight shedding of seed.]** [Russian] *Priroda, Moskva, (Nature, Moscow)* 1959, **48,** No. 11, 115–16, illus. [All-Union Sci. Res. Inst. Agric. Machine Construction, Moscow]

Of annual oil crops, *S. indicum* is among the best because the seed contains 50–65% oil, 24% protein and about 14% carbohydrates. The varieties grown in the southern regions of the Soviet Union, however, are subject to excessive shattering. The 1000-grain weight is 2·5 – 3·5 g and consequently seed loss is high, actual harvests of seed being only 150–200 kg/ha. It is computed that the area in USSR sown with this crop in 1940 was 76,500 ha, but in 1958 the area had declined to 7200 ha. In recent years attempts have been made to produce a non-shattering variety which can be harvested by combine. It is claimed that Slaboosypajuščiisja 3 [Slightly Shattering 3], a variety 1·5 m high which does not branch in dense sowings, meets these requirements.—M.H.

866 KA-SHUI, F. **Studies on the photostage of *Sesamum*.** [Chinese] *Acta Agric. sinica* 1959, **10,** No. 3, 177–88, illus., English summary. [Univ. Sun Yatsen, Canton]

The effect of day-length on leaf morphology, date of flowering, position of first flower bud and fruit production was studied in 3 varieties of *Sesamum*. F. Eng. s.—D.B.

## OIL-SEED FLAX

867 NEGI, L. S. and KINGRA, I. S. **Response of linseed to nitrogen with different seed rates under hill conditions.** *Indian Oilseeds J.* 1959, **3,** No. 3, 162–5, bibl. 5. [Agric. Res. Sta., Dhaula Kuan, Himachal Pradesh, Simla]

The best seed rate for yields of linseed grown under rainfed conditions over a period of 3 yr was 30 lb./acre. The response to $(NH_4)_2SO_4$ at 0, 16, 32 and 48 lb. N/acre was linear up to 32 lb. which gave a yield increase of approx. 1980 lb./acre above the control. In this hilly area, low soil-moisture was the factor preventing further yield increases from seed rates above 30 lb./acre or N fertilizer above 32 lb./acre. This level of N gave the highest net profit.—D.B.

868 SEXSMITH, J. J. **Influence of the ester of 2,4-D applied at various growth stages for the control of Russian thistle (*Salsola pestifer* Nels.) in flax.** *Canad. J. Pl. Sci.* 1959, **39,** No. 4, 458–65, bibl. 21. [Can. Agric. Res. Sta., Lethbridge, Alberta]

Oil-seed flax growing with naturally occurring infestations of *S. pestifer* was treated in each of 5 years with 2,4-D butyl ester at 0, 2, 3 or 6 oz. a.e./ac., applied to different plots at 5-day intervals, beginning when the flax was 0·5–2 in. tall. The treatments were applied on 10 dates in each of 2 yr and on 12 dates in each of 3 yr. Best weed control was obtained by applying the herbicide at either 19–35 or at 45–60 days after sowing. The date on which the first peak period of control occurred depended on the date of germination of the weed seeds. Where the weather after sowing was cool and damp, the best weed control was achieved with the earliest treatment. At the second peak period of weed control the weeds were 6–8 in. tall, and treatment caused permanent curling of the main stem and branches and the formation of a mat of growth close to the ground. Crop height was reduced where 2,4-D was applied 35–50 days after sowing, and maturity was delayed where treatment was applied later than 30 days after sowing. Seed yields from plots treated less than 36 days after sowing were equal to or greater than those from untreated plots. Best results in terms of yield, early maturation and height of the crop above the weeds were obtained with the highest rate of 2,4-D applied 25–30 days after sowing, or earlier under cool, wet conditions.—R.B.

## SAFFLOWER

869 KNOWLES, P. F. **Safflower.** *Advanc. Agron.* 1958, **10,** 289–323, bibl. 75, illus. [Univ. California, Davis]

In the USA, safflower is grown in W. Nebraska, N. Utah, S. Idaho, E. Washington and California. For a satisfactory crop, 16 in. of soil moisture are required and for maximum yields, 25 in. Winter flooding is often fatal to the crop. The tolerance of safflower to low temperatures depends on the variety

and stage of development and is greatest at the rosette stage. Sowing may take place in autumn or spring. Varieties at present available have a slow rate of development and poor ability to compete with weeds. Spineless varieties have a lower oil content in the seeds than spiny varieties. Investigations on oil content and composition, early maturity, disease-, pest- and frost-resistance are reviewed.—R.B.

870 Jasso, R. G. El azafrancillo. [**Safflower.**] *Agricultura téc., Méx.* 1958–9, No. 7, 16–17. [Cent. Invest. Agríc. Noroeste, Ciudad Obregón, Mexico]

Information is given on sowing date, plant density and chemical composition of the seed of safflower (*Carthamus tinctorius*), a crop suitable for the Yaqui Valley.—E.B.O.

## SUNFLOWER

*See also Abs. 896, 923*

871 Stefansson, B. R. **A method for estimating the percentage of hybrids in seedlots of first generation Advance sunflowers by means of a seedling characteristic.** *Canad. J. Pl. Sci.* 1959, **39**, No. 1, 71–4, bibl. 3, illus. [Univ. Manitoba, Winnipeg]

Seed of the hybrid sunflower variety Advance is obtained by growing the open-pollinated variety Sunrise and the inbred variety S-37-388 in the field in alternate groups of 2 rows, and harvesting the seed of the inbred variety. The percentage of hybrid seed obtained by this method is variable, and can be determined by examining the venation of the first true leaves. Those of S-37-388 have a considerably greater number of visible leaf-veins than those of either Advance or Sunrise. In field tests, an average of 91·2% of plants were correctly classified on the basis of leaf venation. In none of the seed samples tested was the error in varietal determination greater than 4·4%, though the percentage of hybrid seed in the samples ranged from 35·1 to 86·9%.—R.B.

872 Soboleva, A. V. [**Combined effect of the trace elements Mo, Mn and Co on photosynthesis and N content in the leaves of *Helianthus annuus*, and on oil formation in the seeds.**] [Russian] *Doklady Akad. Nauk SSSR (Proc. Acad. Sci. USSR)* 1959, **129**, No. 4, 950–2, bibl. 9. [Sci. Res. Inst. Biol. Har'kov State Univ.]

The combined effect of different microelements on plant metabolism has been considered by some authors as antagonistic and by others as synergetic. Apparently, the joint action of any 2 microelements depends on the particular elements concerned. The author's study was made with *Helianthus annuus* var. Ždanov 8281 sprayed with (a) $MnSO_4$, (b) $NaMoO_4$ (concentration of (a) and (b) = $1/10^{-3}$M); and (c) $CoSO_4$ ($1/10^{-4}$M). The control plants were sprayed with distilled water. Each plant received 50 ml of the solution, sprayed 3 times during the vegetative period; the upper leaves (7th or 8th pair) were analysed to determine the effect of the microelements on photosynthesis and N metabolism in the leaves; the oil content of the seed was also determined. There is evidence (from 3 replications of the tests) that the intensity of photosynthesis is increased by Mn, Mo and Co (compared with the control) when applied separately, while this effect is less pronounced if (a) and (b) are applied jointly. When Mo, Mn and Co are applied separately, the % of protein N in relation to total N is lowered, but when Mo + Mn and Mn + Co are applied jointly, the amount of protein N is similar to that of the control. The protein N in the control and in plants sprayed with Mn + Co was higher than that in plants receiving only Mn or Co. When Mo, Mn and Co are applied separately, the oil content of the seed is raised by 3–5%, while Mo + Mn had no positive effect. From this it is concluded that Mo and Mn are antagonistic. Mn + Co lowered oil content in comparison with the effect of their action separately, but produced a higher oil content compared with the control.—M.H.

873 Sackston, W. E. **Effects of artificial defoliation on sunflowers.** *Canad. J. Pl. Sci.* 1959, **39**, No. 1, 108–18, bibl. 7, illus. [Can. Dep. Agric., Winnipeg, Manitoba]

The effect of partial and complete mechanical defoliation of sunflowers at 3 stages of development, so as to simulate the effects of rust and other diseases, was investigated during 1948–52. At the flowering stage, complete defoliation reduced seed yield by 88–93%, and removal of 50% of the leaf area reduced yield by 22–30%. In 1952, yields were reduced 52% by defoliating the upper half of the stem, 14% by defoliating the lower half, and 25% by removing 50% of each leaf. Complete defoliation at the seedling stage significantly reduced yields in 1948 and 1951, while 25% or 50% defoliation had no significant effect on yield. Complete defoliation at maturity significantly reduced seed yield in 1949 only. However, even partial defoliation had an adverse effect on yield. Treatments which reduced seed yields also reduced the weight per 200 seeds.—R.B.

## RAPE

874 Buchli, M. Einfluss des Erntetermins auf Ertrag und Ölgehalt von Raps. [**Influence of time of harvesting on yield and oil content**

**of rape.**] *Mitt. schweiz. Landw.* 1959, **7**, No. 6, 81–3. [Eidg. Landw. Versuchsanstalt, Zürich-Oerlikon]

There were 3 cutting stages of winter rape (*Brassica napus* var. *oleifera* subvar. *biennis*) at 6–8 day intervals from the beginning of yellowing to wilting. Results from 4 years' harvests showed that the second cutting stage (when all pods were becoming yellow and the seeds were darkening but still pliable) gave the highest yields of seed and oil, and the seeds had the highest oil content.—D.B.

875 WETTER, L. R. and CRAIG, B. M. **Varietal and environmental effects on rapeseed. 1. Isothiocyanate and thiooxazolidone content.** *Canad. J. Pl. Sci.* 1959, **39**, No. 3, 395–9, bibl. 13. [Nat. Res. Coun. Can., Saskatoon, Saskatchewan]

Seed from Argentine-type rapes (*Brassica napus* var. *oleifera* subvar. *annua*) contained approximately 3 times more thiooxazolidone (a goitrogen) than did seed from Polish-type rapes (*Brassica campestris* var. *oleifera* subvar. *annua*).—R.B.

876 CRAIG, B. M. and WETTER, L. R. **Varietal and environmental effects on rapeseed. 2. Fatty acid composition of the oil.** *Canad. J. Pl. Sci.* 1959, **39**, No. 4, 437–42, bibl. 5. [Prairie Regional Lab., Saskatoon, Saskatchewan]

Oil from 7 varieties of oil-seed rape grown at 7 locations was analysed by means of gas-liquid phase chromatography. There were significant differences between varieties for all oil properties except the percentage content of $C_{16}$ acids. The major variation in fatty acid composition was in the amounts of oleic, linoleic and erucic acids present. Golden, Swedish, Regina II and Argentine rape [*Brassica napus* var. *oleifera*] produced oil with a high, Arlo and Gute [*Brassica campestris* var. *oleifera*] with an intermediate, and Polish [*B. campestris* var. *oleifera*] with a low content of erucic acid. Variations in oil composition due to locality were insignificant.—R.B.

## POPPY

*See also Abs. 564*

877 STATENS FORSØGSVIRKSOMHED I PLANTEKULTUR, DENMARK. Forsøg med sorter af opiatvalmue. [**Trials with varieties of opium poppy.**] *Medd. 615 Stat. Forsøgsvirk. Plantekult., Kbh.* 1959, pp. 2.

The results are given of trials with 3 varieties of opium poppy at 4 locations in Denmark. In 26 trials, Mahndorfer gave mean seed yields of 13·5 hkg/ha and oil yields of 5·4 hkg/ha. Aarslev Luna and Svalöf Flora in 24 and 16 trials, respectively, both gave seed yields of 14·3 hkg and oil yields of 5·8 hkg/ha. Brief notes are given on each variety.—P.J.B.

## MUSTARD

878 SINGH, S. and SIDHU, H. S. **A schedule for control of mustard aphid by some insecticides.** *Indian Oilseeds J.* 1959, **3**, No. 3, 169–78, bibl. 2. [Agric. Coll., Ludhiana, Punjab]

Experiments were conducted at the Bhupindera Agricultural Farm, Rauni (Patiala) to find the most profitable spraying system for controlling the mustard aphid (*Lipaphis erysimi* Kalt.) on a crop of raya L 18 (*Brassica juncea*). Eight insecticides were applied at 3 spraying intervals (10, 20 or 30 days) beginning when the plants were 2 months old (flower-bud formation) and continuing for a period of about 6 weeks. The 10-day spraying interval kept down the aphid population and resulted in the highest seed yields. Of the insecticides, parathion in a 0·025% suspension or diazinon in a 0·025% emulsion, sprayed at 100–175 gal./acre, are recommended for farmers who understand the precautions to be taken when using phosphatic insecticides; BHC, endrin and nicotine sulphate also at 100–175 gal./acre should be used by others. Taking costs and increased yields into consideration the highest net profit was obtained by using the phosphatic insecticides.—D.B.

# CROP BOTANY

## PHYSIOLOGY

*See also Abs. 1029, 1031, 1036*

879† IYENGAR, C. V. K. **Oscillations and rhythm in the vital activities of plants.** *Proc. Nat. Inst. Sci. India* Part B, 1959 **25**, No. 5, 262–70, bibl. 39.

This is a review of the author's work from 1929–57 on major and minor oscillations in Nature. Designing suitable instruments, the author has re-investigated and recorded the rates of photosynthesis, water absorption, transpiration, leaf-movements, weight changes, respiration, and growth, at intervals ranging from a few minutes to a few seconds, and with magnifications of 400–6000 according to requirements. In all these activities, micro-changes in length, weight or volume were recorded and frequent and almost regular oscillations in rate were observed. Sun-spot data collected by the author revealed oscillatory variations in number. The rhythmic succession of sun-spot maxima is reflected in the activities of plants and animals. [The work of Bünning on internal rhythms in plants is not included in the bibliography.]—D.B.

880 Vaughan, J. G. **The testa of some *Brassica* seeds of oriental origin.** *Phytomorphology* 1959, **9**, No. 2, 107–10, bibl. 11, illus. [Chelsea Coll. Sci. Techn., London, S.W.3]

881 Hubac, Camille. Étude de l'imbibition des graines de rutabaga. [**Study on the imbibition of rutabaga seeds.**] *C.R. Acad. Sci., Paris* 1959, **248**, No. 3, 447–50, bibl. 2.

This study was carried out with seeds of rutabaga (*Brassica campestris* var. *napobrassica*) kept in distilled water at 4°, 28° or 53·5°C.—E.B.O.

882† Collis-George, N. and Sands, J. E. **The control of seed germination by moisture as a soil physical property.** *Aust. J. agric. Res.* 1959, **10**, No. 5, 628–35, bibl. 6.

883† Johri, B. M. and Garg, S. **Development of endosperm haustoria in some Leguminosae.** *Phytomorphology* 1959, **9**, No. 1, 34–46, bibl. 43, illus. [Dep. Bot., Univ. Delhi, India]

884† Büttner, K. J. K. Die Aufnahme von Wasserdampf durch menschliche Haut, Pflanze und Erdboden. [**The absorption of water vapour into human skin, plants and soil.**] *Arch. Met., Wien* 1958, **9**, No. 1, 80–5, bibl. 19, English and French summaries. [Dep. Met. Climatol. Univ. Washington]

Laboratory experiments and field observations showed high amounts of transfer of water vapour into dry and living plants, and into dry soil. The processes involved seem to be based on diffusion and sorption. These results may be explained by assuming the existence of high osmotic pressures in plants ; the reason for this concentration is unknown. F. Eng. s.—E.B.O.

885† Dobrynin, G. M. [**The laws of shoot formation in some grasses.**] [Russian] *Doklady Akad. Nauk SSSR* (*Proc. Acad. Sci. USSR*) 1960, **130**, No. 1, 223–6, bibl. 13, illus. [Leningrad Agric. Inst.]

This 7-yr study of the morphology, histology and functioning of the grass shoot was made with varieties of *Triticum vulgare*, *Secale cereale*, *Avena sativa*, *Phleum pratense* and *Dactylis glomerata* (among others) grown in the field (or in glasshouses) near Leningrad. Special attention was given to the lamina, leaf sheath and ligule. Hitherto the ligule has been studied only in relation to its taxonomic significance (with the exception of Štrekker's monograph in 1931). The so-called periscope-cells of the ligule when under the influence of daylight synthesize a substance which inhibits the growth of the leaf sheath. The functions of the leaf sheath are considered in regard to growth phases of the grasses. —M.H.

886 Gaastra, P. **Light energy conversion in field crops in comparison with the photosynthetic efficiency under laboratory conditions.** *Meded. LandbHogesch. Wageningen* 1958, **58**, No. 4, pp. 12, bibl. 22.

The efficiency of solar energy conversion at wavelengths of 400–700 mμ in sugar-beet grown under fluorescent light decreased from 17·8% at an intensity of $1{\cdot}7 \times 10^4$ ergs/sec./cm² to 7·4% at complete light saturation [value not stated] and 2·2% at an intensity of $35 \times 10^4$ ergs/sec./cm². Where published data on beet crops and on insolation were compared, it was shown that at the height of the growing season the efficiency of solar energy conversion was 7–9%, and that 80–90% of the total organic matter was produced in only 44·5% of the growing season. Comparisons of the estimated rates of photosynthesis in sugar-beet leaves under field conditions with actual optimum rates at comparable light intensities under laboratory conditions showed that the rate of photosynthesis in the field was at least 60% of the optimum rate during a considerable part of the growing season.—R.B.

887 Kamel, M. S. **Efficiency of solar energy conversion as related with growth in barley.** *Meded. LandbHogesch. Wageningen* 1958, **58**, No. 8, pp. 19, bibl. 27.

Barley was grown at 250 plants/m², (a) unshaded, or shaded to (b) 80, (c) 50 or (d) 25% of full daylight intensity. The efficiency of solar energy conversion was low at early growth stages, but increased rapidly to a maximum of 13·6, 10·3, 8·3 and 6·2% for (a), (b), (c) and (d), respectively, between 52 and 65 days after sowing. During the period 11–24 days after sowing and from 66 days after sowing until maturity, efficiency of solar energy conversion increased with decreasing light intensity, while at 25–65 days after sowing, efficiency per unit area of actual plant cover increased with increasing light intensity. The average efficiency of solar energy conversion ranged from 2·9% for (a) to 1·4% for (d). Fresh weight increased with increasing light intensity and reached a maximum 66 days after sowing in the case of (a), when leaf area and number of tillers were also at a maximum, and also (b), while in the case of (c) and (d) maximum fresh weight was reached 2 and 5 weeks later, respectively. Percentage dry matter increased with increasing light intensity at all stages of development, and at its maximum was 3 times as great in (a) as in (d) plants. Maximum leaf area was reached 66 days after sowing in (a) and (d) and 2 weeks earlier than this in (b) and (c). The ratio between leaf area and dry weight increased with decreasing light intensity and decreased with age. In a second experiment with barley grown at 500, 250 and 125 plants/m² without shading, maximum efficiencies of solar energy

conversion were 13·7, 10 and 8·8% respectively and were reached when leaf area, tiller number and fresh weight were at a maximum. Average efficiencies over the growing season were 2·3, 2·9 and 1·8, respectively. Fresh weight, dry weight and green leaf area per plant decreased, and percentage dry matter increased, with increasing plant density. The ratio between leaf area and dry weight increased with density during the first 47 days of growth and afterwards decreased with density.—R.B.

888 KAMEL, M. S. **A physiological study of shading and density effects on the growth and the efficiency of solar energy conversion in some field crops.** *Meded. Landb-Hogesch. Wageningen* 1959, **59**, No. 3, pp. 101, bibl. 72, illus.

[See previous abstract.] Barley was grown in the field at 250 plants/m² with 100, 80, 50 and 25% of full daylight intensity, and unshaded at 500, 250 and125 plants/m². In the early stages of growth, plant height increased with shading, but maximum height was attained with 80 or 100% illumination. Decreasing the light intensity increased the length of internodes and the length and surface area of each leaf, while it decreased stem diameter, breadth and thickness of leaves, the ratio of roots to tops and the 1000-grain weight, delayed spike development and awn emergence, and prolonged both the vegetative phase and the growth cycle. The number of ears per plant, ear length, number of seeds per ear and per plant and the percentage of fertile tillers increased with increasing light intensity. The number of leaves and tillers per plant decreased with shading until 66 days after sowing. The efficiency of solar energy conversion in terms of grain production was 1·27% for unshaded plants and 0·04% for plants receiving 25% illumination. Increasing plant density under full illumination accelerated spike development, awn emergence and ripening, increased the percentage of fertile tillers, the percentage dry matter in roots and ears, the thickness of leaves, 1000-grain weight and internode length, and decreased stem diameter, leaf breadth, number of leaves and tillers per plant, ear length, number of ears per plant and grains per ear, and the fresh- and dry-weight per plant of roots leaves, stems, ears and grain. During the early stages of growth, leaf length per plant increased and the percentage dry matter in leaves, stems and tops decreased, with increasing density, but later in the season these trends were reversed. The number of tillers and leaves per plant reached a maximum earlier in the season at the higher densities. The number of tillers and leaves per unit area and the dry weight per unit area of roots, leaves, stems and ears increased with density at first, but later in the season were greatest at medium density. The efficiency of solar energy conversion increased with density during the first 56–70 days, but later was greatest at medium density. Fodder-beet, var. Groeningia, was grown at a normal spacing of 8·3 plants/m² and at a high density of 25 plants/m². The efficiency of solar energy conversion (a) increased with age to reach a maximum of 10% 67–87 days after sowing at close spacing and a maximum of 7·2% 105–126 days after sowing at normal spacing, and (b) increased with density until 150 days after sowing, then decreased with density. The average conversion efficiency was 4·4% at close spacing and 3% at normal spacing.—R.B.

## GROWTH

889† MAKKINK, G. F. Plantengroei bij droogte. [**Plant growth under conditions of drought.**] *Stikstof* 1959, **2**, No. 24, 420–30, bibl. 20.

Factors influencing the growth of plants under conditions of insufficient moisture supply are discussed.—R.B.

890† RUSSELL, M. B. **Plant responses to differences in soil moisture.** *Soil Sci.* 1959, **88**, No. 4, 179–83, bibl. 10. [Univ. Illinois]

An attempt is made to examine and weigh the evidence presented in the literature in support of conflicting opinions regarding the nature of the response of plants to different soil-moisture conditions in the range between field capacity and wilting point.—E.B.O.

891† EHARA, K. **Studies on the growth behaviour and quality of the forage crops in warm area in Japan. 4. Effect of temperature on the growth behaviour and chemical composition of corn, oats and red clover.** *J. Fac. Agric. Kyushu* 1959, **11**, No. 2, 109–28, bibl. 20.

Maize, oats and red clover were grown in glasshouses with (a) windows closed (high temperature) and (b) windows open (low temperature), the difference in temperature between the 2 series being 2–3°C. Depending on time of day, these glasshouse temperatures were 10–20°C higher than field temperatures. The following plant attributes were studied in series (a) and (b) : time of leaf emergence, plant height, leaf area, percentage of sheathing portion of leaf, internode length, number of tillers, green and air-dry weights, and chemical composition of leaf, stem and flower. Under the higher temperature, plants were taller, the heading of oats was delayed or even inhibited, green and dry weights of plant organs were lower in maize and red clover but higher in oats, and crude-protein content was higher in all plants. The effect of temperatures on the content of other chemical constitutents is given.—D.B.

892 MARTOS, Vera. **Experimental data concerning effect of plant roots on aerial**

**parts. 3. Changes in the amount of nitrogen fractions, free amino acids and nucleic acids in the overground organs of wheat during germination.** *Acta Biol. hung.* 1959, **10**, No. 2, 157–67, bibl. 7, illus., German and Russian summaries. [Dep. Pl. Physiol., Eötvös Loránd Univ., Budapest]

893 MARTOS, Vera. **Experimental data concerning effect of plant roots on aerial parts. 4. Inhibition of nucleic acid metabolism of roots.** *Acta Biol. hung.* 1959, **10**, No. 2, 169–70, bibl. 30, illus., German and Russian summaries. [Dep. Pl. Physiol., Eötvös Loránd Univ., Budapest]

894 MARTOS, Vera. **Experimental data concerning effect of plant roots on aerial parts. 5. Nutritional experiments with isolated leaf cultures.** *Acta Biol. hung.* 1959, **10**, No. 2, 179–86, bibl. 23, German and Russian summaries. [Dep. Pl. Physiol., Eötvös Loránd Univ., Budapest]

## GROWTH SUBSTANCES

*See also Abs. 623, 638, 720, 768, 769, 847.*

895† FLETCHER, W. W. and others. **Gibberellic acid and nodulation of legumes.** *Nature, Lond.* 1959, **184**, No. 4698, 1576, bibl. 5. [Bot. Dep., W. Scot. Agric. Coll., Glasgow]

The authors' tests with several small-seeded leguminous species (5 *Trifolium* spp. and *Medicago sativa*) show that where reduction of nodulation occurs, this is not due to the effect of gibberellic acid on the Rhizobia. There is support for Galston's postulation [*Fld Crop Abstr.* 12 : 1486].—M.H.

896 NEUMANN, J. **An auxin-like action of coumarin.** *Science* 1959, **129**, No. 3364, 1675–6, bibl. 7. [Dep. Bot., Hebrew Univ., Jerusalem, Israel]

Coumarin at concentrations between 10 and 1000 ppm markedly stimulated the elongation of excised segments of *Helianthus* sp. hypocotyls. Maximum stimulation of growth was produced at 250 ppm. Higher concentration strongly stimulated growth for a few hours, after which the rate of elongation declined. The sharpness of the decline increased as the coumarin concentration increased. Results of work with other plants indicate that coumarin acts as a naturally occurring growth regulator.—R.B.

897 DAS, N. **Studies on the effect of time factor on the stimulation of root growth by certain antiauxins.** *Indian J. Pl. Physiol.* 1958, **1**, 44–53, bibl. 19. [Gauhati Univ., Assam]

898 NORMAN, A. G. **Inhibition of root growth and cation uptake by antibiotics.** *Proc. Soil Sci. Soc. Amer.* 1959, **23**, No. 5, 368–70, bibl. 12. [Univ. Michigan, Ann Arbor]

899† WILLIAMS, C. N. **Action of inhibitor-β on the growth of *Striga* seedlings.** *Nature, Lond.* 1959, **184**, No. 4698, 1577–8, bibl. 5, illus. [Bot. Dep., Univ. Coll., Ibadan, Nigeria]

Unsoaked, air-dried seeds of *S. lutea* contain highly active growth inhibitors that move in the region of $R_F$ 0·6 in paper chromatography, while in seeds soaked for several days the concentration of the inhibitors is greatly reduced. The *Striga* inhibitory zone has acidic properties.—M.H.

## NUTRITION

900 HUFFAKER, R. C. and WALLACE, A. **Effect of potassium and sodium levels on sodium distribution in some plant species.** *Soil Sci.* 1959, **88**, No. 2, 80–2, bibl. 7. [Univ. Calif., Los Angeles]

Studies of the absorption and translocation of Na with $^{22}Na$ in 4 plant species, including maize and soyabean var. Hawkeye (considered as poor accumulators of Na) indicated that each absorbed and translocated Na in varying degrees. In maize, the roots accumulated Na, and the Na moved only a short distance into the shoot. In soyabean, the small roots accumulated a greater concentration of Na than did larger roots ; with a low Na level, Na was excluded at the shoot-root transition zone ; with a high Na level, Na was translocated higher into the shoots but the leaves tended to exclude Na. In all species, a high level of K inhibited the absorption of Na but resulted in a more uniform distribution of Na throughout the plants than did a low level of K or no K.—E.B.O.

901† ORAM, P. **Boron deficiency. 1. The importance of boron to world crops. 2. Recognition and correction.** *World Crops* 1959, **11**, No. 7, 248–50 and No. 8, 285–7, bibl. 11, illus.

902 ŠKOL'NIK, M. Ja. and others. **The causes of the difference in the degree of boron requirement [in plants] under different ecological conditions.** [Russian] *Izv. Akad. Nauk, SSSR (Bull Acad. Sci., USSR) Biol. Ser.* 1959, No. 5, 663–73, bibl. 45.

The authors' observations are concerned with metabolism in flax, *Brassica* sp., sugar-beet, cotton and barley when grown under varying conditions of nutrition and temperature. See also *Fld Crop Abstr* : 9 : 622.—M.H.

903 SEATZ, L. F. and others. **Crop response to zinc fertilization as influenced by lime and phosphorus applications.** *Agron. J.* 1959,

**51,** No. 8, 457–9, bibl. 6. [Tennessee Agric. Exp. Sta., Knoxville]

Flax and sorghum were grown in loam soil in a growth chamber at 82°F with 1000 f.c. light for 16 hr./day. Liming at rates up to 8 tons/ac. equivalent produced Zn deficiency of increasing severity. Response to the addition of 20 lb. Zn/ac. equivalent was greatest at 6 tons lime/ac. equivalent. $P_2O_5$ up to 1000 lb./ac. equivalent increased yields, but did not influence the response to Zn. The best liming material consisted of $CaCO_3$ and $MgCO_3$ in the ratio of 2:1. The plants contained less P, K, Ca and Mg when the supply of Zn was adequate. Flax was able to absorb proportionately more Mg from the soil when the amount available was small.—J.D.J.

904 Brown, J. C. and Tiffin, L. O. **Iron chlorosis in soybeans as related to the genotype of rootstock : 2. A relationship between susceptibility to chlorosis and capacity to absorb iron from iron chelate.** *Soil Sci.* 1960, **89,** No. 1, 8–15, bibl. 11, illus. [U.S. Dep. Agric., Agric. Res. Serv., Beltsville, Md]

905† Agricultural Gazette of New South Wales. **Molybdenum deficiency in plants.** *Agric. Gaz. N.S.W.* 1959, **70,** Pt. 8, 418–23. This is a review article.—S.M.J.

906 Raheja, P. C. and others. **Crop response to micro-nutrients under Indian conditions.** *Indian J. Agron.* 1959, **3,** No. 4, 254–63, bibl. 55. [Agron. Div., I.A.R.I., New Delhi]

This is a review of recent literature, mainly from India, concerning results of field and pot experiments on the use of micro-nutrient elements on rice, wheat, (also oats, barley and maize), cotton, potato, *Sorghum vulgare, Eleusine coracana, Pennisetum typhoideum, Phaseolus radiatus,* and *Cicer arietinum.* Spraying appears to be the best method of application under Indian conditions.—D.B.

907. Biswas, B. B. and Sen, S. P. **Translocation and utilization of sulphate-$S^{35}$ and phosphate-$P^{32}$ in the pea plant.** *Indian J. Pl. Physiol.* 1959, **2,** No. 1, 1–8, bibl. 14, illus. [Radiochem. Lab., Bose Research Inst., Calcutta–9]

Sulphate was translocated to the topmost leaf of intact, 10-day-old plants in less than 15 min. It accumulated in the youngest leaves and passed downwards into older ones. The distribution pattern and amount taken up were the same in light and in darkness. The translocation pattern of P was similar to that of sulphate, but uptake was greater in light than in darkness. Organic compounds were formed in young leaves, but less rapidly than those of S.—R.D.W.

908† Blanchet, R. Actions directes et indirectes de la matière organique humifiée sur la nutrition des végétaux vasculaires. (Revue bibliographique). **[Direct and indirect effects of humified organic matter on the nutrition of vascular plants. (Bibliographical review).]** *Ann. agron., Paris* 1958, **9,** No. 4, 499–532, bibl. 72, English, German and Russian summaries. [Sta. Cent. Agron., Versailles, France]

The addition of small amounts of humic acid to well balanced nutrient solutions hastens the absorption of mineral ions by the surface of the roots and their penetration into the cells. The metabolism of plants is stimulated by the presence of humus, and their respiration is markedly increased. Plants are probably capable of utilizing certain growth substances (vitamins, auxins) contained in humified organic matter. In addition to improving the physical, chemical and biological properties of the soil, humus has a direct effect on the mineral nutrition of plants, so that higher yields are obtained than with mineral elements alone. F. s.—E.B.O.

## CHEMICAL COMPOSITION

909† Virtanen, A. I. Antimikrobiell wirksame Substanzen in Kulturpflanzen. **[Antimicrobial substances in crop plants.]** *Angew. Chem.* 1958, **70,** No. 17/18, 544–52, bibl. 42, illus. [Biochem. Inst., Helsinki, Finland]

An account is given of the occurrence, isolation, chemical structure, properties and fungicidal and antibacterial action of antibiotic substances present in young rye plants, red clover, white clover, lucerne, carrots, potatoes, and *Brassica* spp. amongst other crop plants.—D.B.

## TECHNIQUES AND APPARATUS

*See also Abs. 601, 844, 845, 940, 985, 995, 996.*

910 DeMent, J. D. and others. **A method for measuring short-term nutrient absorption by plants : 3. Nitrogen.** *Proc. Soil Sci. Soc. Amer.* 1959, **23,** No. 5, 371–4, bibl. 6. [Div. Agric. Relations, Tennessee Valley Authority, Wilson Dam, Alabama]

Roots of N-deficient oat plants were placed in contact with soil fertilized with N at 10, 20, 30 or 40 mg/200 g dry soil [See *Fld Crop Abstr.* 11 : 822.] N uptake plotted against time described a sigmoid curve. During the first 3 days the rate of uptake was slow, but afterwards increased rapidly and then decreased. The period of rapid uptake was lengthened where higher N rates were used. After 7 days, whole plants contained between 62 and 93% of the N applied, and tops 38·5–67%. There was a very high correlation between the N content of plant tops and that of tops plus roots. Nitrate- and ammonium-ions were absorbed at the same rate.—R.B.

911 Friend, D. J. C. and others. **The relative effectiveness of standard cool white fluorescent and incandescent light in the photoperiodic response of Marquis wheat, Garnet wheat and Wintex barley.** *Canad. J. Pl. Sci.* 1959, **39**, No. 2, 229–40, bibl. 11. [Can. Dep. Agric., Ottawa, Ontario]

Spring wheat and spring barley were grown in pots at 23°C. with 8 hr. daylight for 3 weeks, and then given supplementary illumination as follows : (a) 10 f.c. incandescent light for 16 hr./day ; or 5 min. light in the middle of the dark period using (b) 50 f.c. incandescent light, (c) 50 f.c. fluorescent white light, (d) 200 f.c. fluorescent light, (e) 500 f.c. fluorescent light, or (f) no supplementary illumination. After 7 days, some plants from each treatment were transferred to (f). Plants were dissected at 21, 28, 30, 33, 36, 46 (barley only) or 63 (wheat only) days after sowing. Incandescent light was approximately 4·4 times as photoperiodically active as white fluorescent light of equivalent intensity. There was little difference in the photoperiodic effect of incandescent or fluorescent lamps of equal input wattage. Interruption of the dark period accelerated (a) the change from the vegetative to the flowering phase, and (b) floral development. Garnet wheat showed a greater response to long photoperiods than did Marquis wheat or Wintex barley.—R.B.

912 Wiggans, S. C. and Gardner, F. P. **Effectiveness of various solutions for simulating drouth conditions as measured by germination and seedling growth.** *Agron. J.* 1959, **51**, No. 6, 315–8, bibl. 13. [Iowa Agric. Exp. Sta., Ames]

The effect of solutions of sucrose, D-mannitol, NaCl and polyvinylpyrrolidone (PVP) of 5, 10 and 15 atm. osmotic pressure on the germination of seeds of *Sorghum vulgare* var. DeKalb D-50 and Reliance was determined. The solutions were prepared according to the formula $g = PVm/RT$, where g = weight of solute in g, P = osmotic pressure, V = volume in litres, m = molecular weight of solute, R = 0·0825 atm./deg./mole, and T = absolute temperature. All solutions caused an initial delay in germination. Increases in osmotic pressure reduced percentage germination ; that of DeKalb D-50 after 96 hr. was greater than that of Reliance in the same solution. D-mannitol reduced germination least, PVP and NaCl most. The effect of the various solutions on radicle elongation was of the same order as that on percentage germination.—R.B.

913† Montgomery, F. H. and Riddell, R. T. **An inexpensive plant growth chamber.** *Canad. J. Pl. Sci.* 1959, **39**, No. 1, 80–1, illus. [Ontario Agric. Coll., Guelph]

The growth chamber described is fitted with the following equipment : 28 fluorescent tubes and ten 60-watt bulbs, giving 1800 f.c. at a distance of 2 ft ; a fan unit driven by a one-twelfth h.p. motor, which recirculates the air in the chamber 3 times per min. ; a 2 h.p. refrigeration unit, four 750-watt heaters and 3 thermostats. The temperature in the chamber can be controlled to within ± 2°F.—R.B.

914† Sweetman, I. C. **A simple conversion of a standard precision sprayer for logarithmic spraying.** *Proc. 12th N.Z. Weed Control Conf.* 1959, 11–16, bibl. 3. [Rukuhia Soil Res. Sta., Hamilton, N.Z.]

A simple method is described for modifying an " Oxford Precision " sprayer. The main feature of the modification is the provision of 2 chambers, and the use of an arrangement of jets for mixing automatically solutions passing through the concentrate chamber. Calibration tests show that the rate of decrease in concentration is logarithmic over the most useful part of the possible range. The modification is simple and inexpensive, contains no moving parts, and does not preclude its use as a simple precision sprayer for its original purpose. F. S.—M.H.

## RADIOBIOLOGY

*See also Abs. 581, 582, 592, 600, 603, 616, 624, 702, 737, 900, 907, 1036.*

915† Romney, E. M. and others. **Influence of stable Sr on plant uptake of $^{90}Sr$ from soils.** *Soil Sci.* 1959, **87**, No. 1, 42–5, bibl. 5. [Univ. California, Los Angeles]

Different amounts of $Sr(NO_3)_2$ and $SrSO_4$ were applied to 3 types of soil contaminated with $^{90}Sr$ to determine to what extent stable Sr might reduce the uptake of $^{90}Sr$ as a result of carrier dilution. Applications of stable Sr at levels ranging from 0·1 to 5 me. Sr per 100 g of air-dry soil increased the uptake of $^{90}Sr$ by beans (*Phaseolus vulgaris*) and Ladino clover (*Trifolium repens*). Stable Sr displaced $^{90}Sr$ from the soil exchange complex into the soil solution where it was more readily available to the plant. This effect was most apparent in an acid soil containing a low level of native Sr. The uptake of stable Sr was linear with respect to the level of exchangeable Sr in the soil, but the total amount of Sr accumulated by the plant was dependent on the available Ca in the soil. Plants obtained more stable Sr from soils treated with $Sr(NO_3)_2$ than from those treated with $SrSO_4$. The amount of stable Sr required to reduce effectively the uptake of $^{90}Sr$ by plants from soils by carrier dilution was greater than 5 me. Sr per 100 g of soil, i.e. equivalent to more than 5 tons of applied Sr per ac. F. S.—E.B.O.

916† Agricultural Research Council. **Strontium 90 in human diet in the United**

**Kingdom 1958.** *Rep. 1 radiobiol. Lab. A.R.C.* 1959, London, pp. 75, bibl. 36, maps, 4s.

A survey is being carried out to determine the level of $^{90}Sr$ in the human diet in the UK. In addition, the level of $^{90}Sr$ in pasture grass and soil is being investigated in various localities. This report gives results of measurements of $^{90}Sr$ in human food, with particular emphasis on milk, up to the end of 1958. Other foods examined were potatoes, leafy brassicas and flour. In any investigation of $^{90}Sr$ in human diet it is important to determine the ratio of $^{90}Sr$ to Ca in the total diet. It has been recommended that immediate consideration would be required if the concentration of $^{90}Sr$ in human diet showed signs of rising much beyond 40 $\mu\mu$c (micro microcuries) per g of Ca. It appeared that during 1958 the ratio of $^{90}Sr$/Ca in the UK diet nowhere approached this level ; the average ratio was approximately 6 $\mu\mu$c/g.—E.B.O.

917 STEENBERG, K. **The effects of radiation in plant nutrition experiments with radiophosphorus.** *Nuclear Sci. Abstr.* 1959, **13,** No. 8 supplement, 803. [Agric. Coll. Norway, Vollebekk] [Paper presented at 2nd U.N. Conf. Peaceful Uses of Atomic Energy]

Oats and barley were grown in pot experiments in sandy soil fertilized with the equivalent of 40 or 80 lb. $P_2O_5$/ac. thoroughly mixed into the soil. The fertilizer contained 20 levels of radioactivity ranging from 0 to 200 mc/g of P in experiments with oats, and from 0 to 100 mc/g of P in experiments with barley. Severe injury to the plants occurred at the highest levels of radioactivity. Visual symptoms of radiation damage were described and discussed.—R.B.

918 THAINE, R. and others. **Translocation of labelled assimilates in the soybean.** *Aust. J. biol. Sci.* 1959, **12,** No. 4, 349–72, bibl. 13, illus. [Botany School, Univ. Melbourne]

When $^{14}CO_2$ was supplied to a limited area of a mature, illuminated soyabean leaf, radioactive compounds appeared rapidly in the root, shoot apex and young, unexpanded leaves. Translocation to these " sinks" took place in the light, at the same time as photosynthesis proceeded at the source. Translocation of radioactive compounds also went on in darkness after fixation of $^{14}CO_2$ in the leaf in the light. After 24 hr. the concentration of mobile tagged compounds in the source leaf was very low, but considerable activity remained in the form of insoluble compounds other than starch. It was concluded that masking lowers the concentration of mobile assimilates in leaves. In the soyabean the vascular pattern is such that movement of assimilate from the source leaf to any other leaf can occur. Movement into mature leaves was slight compared with movement into growing points or expanding leaves. Acropetal movement in source leaves was less than basipetal movement, but was increased by shading. In general, shading a mature leaf increased the tendency of tagged assimilate to move into it, presumably because the total concentration of assimilates in the leaf was lowered. The removal of all mature leaves between source and apex significantly increased movement to the apex. This was thought to be due to the lowering of the concentration of total assimilate at the apex, resulting from the removal of leaves which would normally export untagged assimilate. The direction of movement from a given leaf depended on the age and position of the leaf on the stem. A young leaf formed part of the major apical sink for upward-moving assimilate and for its own photosynthetic products, exporting nothing to the rest of the plant. When it reached 60% of its maximum size, it began to lose this function and increase in importance as an exporting organ. Material from a source leaf close to the shoot apex moved predominantly to the apex, that from older leaves mainly to the root. It was concluded that the radioactive compound moves along a concentration gradient of the whole assimilate, labelled and unlabelled. It does not move uniformly along its own concentration gradient. F. S.—A.M.H.

919 FRIED, M. and others. **Rubidium-potassium relations in the soil-plant system.** *Proc. Soil Sci. Soc. Amer.* 1959, **23,** No. 5, 360–2, bibl. 5. [Eastern Soil and Water Mgmt Br., Agric. Res. Serv., USDA, Beltsville, Maryland]

In experiments with millet [*Setaria italica*] grown in a mixture of sand and ion-exchange resins, the ratio of K to Rb in the plants bore a constant relationship to the ratio of K to Rb in the substrate. Where soils were used as substrate, K and Rb appeared to react independently with the soils. Increases in the rate of applied Rb markedly increased the percentage of Rb taken up by the plants, while high rates of applied K had only a slight effect on Rb uptake. It was concluded that $^{86}Rb$ was not a suitable tracer for K in experiments with plants grown in soils.—R.B.

## MISCELLANEOUS

920 GUINET, P. Essai d'identification des graines de chénopodes commensaux des cultures ou cultivés en France. [**An attempt to identify the seeds of *Chenopodium* spp., either cultivated or weeds of crops, in France.**] *J. Agric. trop. et Bot. appl.* 1959, **6,** No. 6–7, 241–66, bibl. 11, illus.

Descriptions are given of the seeds of 23 species of *Chenopodium*, among which is *C. quinoa*.—E.B.O.

921 STEPHENS, S. G. **Salt water tolerance of seeds of *Gossypium* species as a possible factor in seed dispersal.** *Amer. Nat.* 1958,

**92,** No. 863, 83–92, bibl. 15, illus. [N. Carolina State Coll., Raleigh]

922 Bahteev, F. H. **The discovery of *Hordeum lagunculiforme* Bacht. in the Turkmenian SSR.** [Russian] *Doklady Akad. Nauk SSSR (Proc. Acad. Sci. USSR)* 1959, **129,** No. 1, 216–19, bibl. 19, illus. [V.L. Komarov Bot. Inst., Acad. Sci. USSR]

See also *Fld Crop Abstr.* 10 : 62.

923 Oertli, J. J. **Effect of salinity on susceptibility of sunflower plants to smog.** *Soil Sci.* 1959, **87,** No. 5, 249–51, bibl. 10, illus. [Univ. California, Los Angeles]

Sunflower (*Helianthus annuus*) plants were grown in nutrient solutions of different salinity obtained by using multiple strengths of macronutrients, or in sand kept moist with these same solutions. It was found that salinity increased the resistance of plants to injury by smog. According to the theory advanced, the entry of smog into plants is impeded by the fact that under conditions of high-moisture stress their stomata are more closed than at low-moisture stress, and thus their resistance to smog is increased.—E.B.O.

924† Gorenflot, R. La polyploïdie chez les végétaux. [**Polyploidy in plants.**] *Année biol.* 1958, **34,** No. 9–10, 361–94, bibl. 135, illus. [Lab. Biol. Vég., Fac. Sci., Orsay, Seine-et-Oise, France]

Among the aspects considered in this review are : geographical distribution of polyploids ; and polyploidy in cultivated plants (natural polyploids include wheat and cotton).—E.B.O.

925† Petrov, V. V. [**Review of papers on the use of natural vegetation as an indicator of soil conditions.**] [Russian] *Izv. Timirjazevsk. S-H Akad. (Bull. Timirjazev agric. Acad.)* 1959, No. 4 (29), 75–84, bibl. 42. English summary.

926 Milne, A. and others. **A controversial equation in population ecology.** *Nature, Lond.* 1959, **184,** No. 4698, 1582–3, bibl. 12. [Durham Univ. Sch. Agric., Newcastle upon Tyne]

927† Mao, Y. T. **A preliminary list of crop plant collections and their custodians.** *Pl. Introd. Newsletter 6 FAO* 1959, pp. 124.

Collections of crop plants maintained by botanists and plant breeders are recorded in this list which was prepared with a view to encouraging the exchange of plant material. The scientific names of crops, the sizes and, in some cases, the nature of the collections, as well as the names and addresses of the custodians, are given.—E.B.O.

928 Whyte, R. O. **Plant exploration, collection and introduction.** *Agric. Studies 41 FAO* 1958, pp. 117, bibl. 133, illus.

The main objects of this publication were : to review briefly the botanical history of some representative economic crops among which are wheat, rice, maize, cotton, soyabean and potato ; to indicate some crops in which further advances could be made through the exploration, collection and introduction of new material ; to present current views on a co-ordinated scientific approach; and to suggest how an international organization could provide co-ordination and technical guidance. A chapter deals with techniques used in plant collection and introduction. There is a subject index.—E.B.O.

## WEEDS AND WEED CONTROL

929 Thurston, Joan M. **A comparative study of the growth of wild oats (*Avena fatua* L. and *A. ludoviciana* Dur.) and of cultivated cereals with varied nitrogen supply.** *Ann. appl. Biol.* 1959, **47,** No. 4, 716–39, bibl. 13. [Rothamsted Exp. Sta., Harpenden, Herts]

Wild oats are most susceptible in the seedling stage to competition from the sown crop. Nitrogenous fertilizer applied to an infested field is unlikely to alter the balance between the yields of crop and of wild oats. F. S.—M.H.

930 Journal of Agricultural and Food Chemistry. **Wild oat the target.** *J. agric. fd Chem.* 1959, **7,** No. 12, 808–9, illus.

Recommended rates for the post-emergence herbicide carbyne (4-chloro-2-butynyl N-(3-chlorophenyl) carbamate) are 0·5 lb./ac. in wheat, barley and flax, and 0·5–1 lb./ac. for peas and sugar-beet, to be applied when the wild oat plants have an average of 1·5–2·25 visible leaves. Avadex (2,3-dichloroallyl diisopropylthiocarbamate) has given 90–98% control of wild oats in wheat, barley, flax and sugar-beet where applied at 1·5–2 lb./ac. before sowing ; it remained active for 6–8 weeks.—R.B.

931† Pryor, M. H. **Hoary cress : new control findings.** *Bull. Dep. Agric. Calif.* 1959, **48,** No. 1, 11–14, bibl. 4, illus.

The name hoary cress is applied to *Cardaria draba, C. draba* var. *repens* and *C. pubescens*. The last-

named is the least common, but tends to be more aggressive and is more difficult to control by herbicides than *C. draba*. The seeds of these spp. survive in the soil for only 3–4 yr. Herbicides capable of controlling these weeds are : amitrol at 4–16 lb./ac. and 2,4-D butoxyethanol ester at 2 lb. a.e./ac. In preliminary trials, good control was given by TBA at 20–40 lb./ac ; 2,4-DB may also prove effective.—R.B.

932† Institut National pour l'Étude Agronomique du Congo Belge. [**Water hyacinth (*Eichhornia crassipes*).**] *Rep. INÉAC 1958*, 1959, 88.

In preliminary trials, it was found that the water hyacinth is self-fertile and that a post-maturation period of 2 months is indispensable for seed germination, which is also dependent on particular conditions of light and temperature.—E.B.O.

933 Worsham, A. D. and others. **Stimulation of *Striga asiatica* (witchweed) seed germination by 6-substituted purines.** *Science* 1959, **130**, No. 3389, 1654–6, bibl. 15. [N. Carolina Agric. Exp. Sta., Raleigh]

Seeds of *Striga asiatica* were germinated on filter paper soaked in distilled water, aqueous maize root exudate, or aqueous solutions of purine, adenine or one of 19 adenine derivatives at concentrations of 0·1, 0·5, 1, 5, 10, 25 or 50 mg/l. Seed germination was greatest where maize-root exudate or adenine derivatives with phenyl, benzyl, phenylethyl or furfuryl radicals substituted on the amino group were added. The concentration of purine derivatives giving maximum germination varied with the compound used but was 5 or 10 mg/l for most compounds. Enlargement and emergence of cotyledons and elongation of the shoot apex occurred in seeds treated with purine derivatives at concentrations greater than the threshold, and seedlings survived for several weeks.—R.B.

934 Williams, C. N. **The parasitism of witchweed — a review.** *W. Afr. J. of Biol. Chem.* 1958, **2**, No. 3, 57–73, bibl. 105, illus.

935† Racovitza, A. Nouvelles observations sur la germination des graines d' *Orobanche ramosa* L. [**New observations on the germination of *O. ramosa* seeds.**] *J. Agric. trop. et Bot. appl.* 1959, **6**, No. 1–3, 111–14, bibl. 4.

Laboratory trials were carried out to study the germination of *Orobanche ramosa* seeds in the presence, or absence, of roots of *Carum ajowan*, with different applications of NPK fertilizers, and at different temperatures. [See also *Fld Crop Abstr.* 12 : 1546.] The application of superphosphate favoured the root secretions of *C. ajowan*, which stimulate the germination of *O. ramosa* seeds ; on the other hand, it inhibited sucker growth in *O. ramosa*. In every case, a temperature which varied daily from 16°–18° to 24°C was more favourable to the germination of *O. ramosa* seeds, and to the fixation of the suckers on the roots of *C. ajowan*, than was a temperature which varied daily from 21° to 24°C.—E.B.O.

936† George, K. **A general survey of the weeds of Calcutta and its suburbs.** *Allahabad Fmr* 1959, **33**, No. 2, 85–138, bibl. 90. [Bose Res. Inst., Calcutta]

The paper contains lists of weeds classified by (1) families, (2) ecological habitat, (3) the crops among which they grow, and (4) their uses (medicine, fodder, food, and industrial purposes).—D.B.

937† Rochecouste, E. **Observations on chemical weed control in Mauritius.** *Bull. 10 Mauritius Sug. Industr. Res. Inst.* 1958, pp. 65, illus. [Received Oct., 1959]

This publication is concerned with the weeds of sugar-cane, their distribution and control in Mauritius. The weeds of Mauritius number about 400 species, most of which have been introduced and approximately half of which are annuals. The principal weeds are : *Cynodon dactylon, Phalaris arundinacea* [see *Fld Crop Abstr.* 12 : 1533], *Paspalidium geminatum, Ischaemum aristatum, Digitaria timorensis, D. horizontalis, Setaria pallide-fusca, S. barbata, Paederia foetida, Cyperus rotundus* and *Heliotropium amplexicaule*. A 10-page list is given of weed species with notes on their distribution, agricultural importance and control.—E.B.O.

938† Zonderwijk, P. Mededeling No. 111. Onkruidbestrijding met chemische middelen. 3e herziene, sterk uitgebreide, uitgave. [**Information booklet No. 111. Weed control with chemicals. Third revised, greatly enlarged edition.**] 1959, pp. 223, illus., Wageningen, Plantenziektenkundige Dienst, 24 × 17 cm., f.2·75.

Descriptions are given of the herbicides in current use in the Netherlands and of their uses for controlling weeds in cereal, root, legume and fibre crops, grassland, and waterways. The most important agricultural weeds are described and their susceptibility to various herbicides is shown in tabular form. There is a special section on the control of resistant weeds. [See *Fld Crop Abstr.* 8 : 734.]—R.B.

939† Harris, G. S. **The significance of buried weed seeds in agriculture.** *Proc. 12th N.Z. Weed Control Conf.* 1959, 85–92, bibl. 5. [Grassl. Div., DSIR, Palmerston North, N.Z.]

The technique for studying buried weed seeds and the evaluation of the data obtained are outlined—M.H.

940 PETZOLDT, K. Wirkung des Mähdruschverfahrens auf die Verunkrautung. [**The effect of the use of the combine harvester on weed incidence.**] *Z. Acker- u. PflBau* 1959, **109**, No. 1, 49–78, bibl. 64, English summary. [Inst. PflSchutz, Landw. Hochsch. Hohenheim, Stuttgart/Hohenheim, W. Germany]

The increased weed incidence on arable land resulting from the use of the combine harvester and measures for its reduction were investigated for 3 years on, mainly, wheat land of 18 farms in Baden-Württemberg. Special attention was given to the weed-seed content of the chaff. When the combine harvester is used, the harvesting date is later than when other implements are used, and this favours an increase of certain weed species, especially grasses. Species with a mechanism for wind dispersal were constantly present in the chaff. Therefore the machine exercised a selective action on the weed population. Measures to reduce the danger from weed-seed dissemination are outlined. They include : timing of the harvest, which should not be delayed more than 1 week beyond that normal for an area ; removal of the chaff ; slow driving and careful adjustment with regard to the wind ; special attention to small-seeded weeds during weed control ; retention of root crops and grazing land in the rotation.—D.B.

941† YANG-HAN, L. and HAN-CHING, H. **A general survey of the weeds and ecological anatomy study of the typical plant indicators of the National Kwangpei Farm and its vicinity located on the saline soil, newly cultivated region.** [Chinese] *Acta Agric. sinica* 1959, **10**, No. 2, 102–20, bibl. 29, illus., English summary.

942 ZEILER, E. H. De invloed van weersgesteldheid en gewas op de onkruidbegroeiing van een droog zandbouwland. **Influence of weather and crop on the weed-growth of a dry sandy arable field.** *Jaarb. Inst. Biol. Scheik. Onderz. Landb-Gew. 1959* 1959, 175-80, bibl. 3, English summary.

The weed vegetation of a dry sandy arable field near Wageningen was surveyed, using 50-cm-square quadrats, during June, July, Aug. and Sept. during 1954–8. The field was sown to rye in the third year and oats in other years. *Chenopodium album*, which is not really a weed of cereals, decreased in population throughout the period. A great increase of *Apera spica-venti* occurred after sowing uncleaned rye seed, but extensive cultivation in the following year caused a decrease in the population of this species. This weed again increased in the fifth year when no spring ploughing took place, but *Capsella bursa-pastoris*, *Erysimum cheiranthoides*, *Lamium amplexicaule*, *Polygonum convolvulus* and *Viola arvensis* decreased, due to competition from *A. spica-venti* and *Agropyron repens* and possibly to the incidence of drought in the previous year. *Veronica arvensis*, *V. hederifolia*, *Anagallis arvensis* and *Vicia hirsuta* increased in population in the rye crop, while *Convolvulus arvensis* decreased strongly. The absence of *Convolvulus arvensis* and *Anagallis arvensis* on the S. side of the field indicated that the soil there was less loamy. The wet summers of 1954 and '56 did not appear to have a direct effect on weed populations in the following years.—R.B.

943† VAN DER WEIJ, H. G. and ROZENBOOM, G. De chemische onkruidbestrijding bij het onderhoud van watergangen. **Chemical weed control in the maintenance of ditches.** *Jaarb. Inst. Biol. Scheik. Onderz. LandbGew. 1959* 1959, 65-71, illus., English summary.

Results of experimental work on ditch cleaning using herbicides not toxic to fish or livestock have shown that floating or partly-submerged broad-leaved weeds can be controlled with 2 kg MCPA/ha, and grasses with 15 kg dalapon/ha. Where ditches are temporarily drained, 50 kg TCA/ha can be used in place of dalapon. Herbicidal treatment costs less than mechanical clearing. Completely submerged weeds cannot as yet be eradicated with herbicides. F. Eng. s.—R.B.

944† THOMPSON, F. B. **Weed control in fodder crops with monochloracetate.** *Proc. 12th N.Z. Weed Control Conf.* 1959, 99–105, bibl. 2. [Rukuhia Soil Res. Sta., Hamilton, N.Z.]

Sodium MCA at 15 lb./ac. may be used for weed control in chou moellier and swedes if the crops have 4 or more leaves. Soft turnips are more susceptible and should have 6 or more leaves. MCA satisfactorily controls willow weed (*Polygonum persicaria*) and redroot (*Amaranthus retroflexus*) in brassica crops, but fat hen (*Chenopodium album*) and grassy weeds are not controlled. Promising results were obtained with MCA on peas. Fodder-beet is susceptible to MCA. Disturbance of the soil during mechanical planting of fodder-beet made pre-planting applications of CIPC unsatisfactory, but post-planting applications were more promising. F. s.—M.H.

945 BARTLEY, C. E. **Triazine compounds.** *Fm Chem.* 1959, **122**, No. 5, 28–34, bibl. 12, illus. [Geigy Agric. Chem.]

The herbicidal action of 13 substituted triazine compounds under conditions in the USA is reviewed.—R.B.

# SURVEYS AND LAND USE

## SURVEYS

946† Satyanarayana, K. V. S. and Rawat, M. S. **Survey and classification of land in Gheora Village, Delhi State. 1.** *J. Soil Wat. Conserv. India* 1958, **7,** No. 1, 18–22, illus. [Indian Agric. Res. Inst., New Delhi]

947† Satyanarayana, K. V. S. and Bali, Y. P. **Survey and classification of land in the villages Bapraula, Bakarwala and Mundka (Dabar tract), Delhi State. 2.** *J. Soil Wat. Conserv. India* 1958, **7,** No. 1, 22–6, bibl. 2, illus. [Indian Agric. Res. Inst., New Delhi]

948† École Nationale d'Agriculture d'Alger. Voyage d'études en Israël de la promotion 1955–1958, Mars-Avril 1958. [**Educational journey to Israel by third-year students, March-April, 1958.**] *Publ. École Nat. Agric. Alger* 1958, pp. 133, illus. [Received Sept., 1959]

Information is given on the agriculture of Israel.—E.B.O.

949 Heyne, E. G. **Agronomic trends and problems in the Great Plains. 2. Field crops.** *Advanc. Agron.* 1958, **10,** 8–15, maps 1. [Kansas State Coll., Manhattan]

Wheat is grown throughout the entire Great Plains region. Cotton and sorghum predominate in the Caprock area of Texas, sorghum and wheat in the area immediately N. of this, maize and wheat in the central Great Plains, and wheat and flax in the N. Maize is grown to the greatest extent in central Nebraska, especially under irrigation, and sugar-beet under irrigation in Colorado, Montana, Wyoming, Nebraska and Kansas. Other field crops grown in the Great Plains include oats, barley, rye, sorghum and other millets, field peas, cowpeas, potatoes, sunflowers, and safflower. Between 1945 and '54 the percentage of crop failures was 12·3% for wheat, 2·3% for maize, 10·8% for barley and 13·1% for oats. Currently grown sorghum and wheat varieties are given. [See Abs. 994.]—R.B.

950 Cabral, A. L. A agricultura da Guiné. Algumas notas sobre as suas características e problemas fundamentais. [**Agriculture in Portuguese Guinea. Some notes on its characteristics and fundamental problems.**] *Agros, Lisboa* 1959, **42,** No. 4, 335–50, bibl. 10.

951 Belien, J. L. L'agriculture au nord du Territoire de Lubutu en District du Maniema. Réflexions sur son développement. [**Agriculture in the north of Lubutu Territory in the District of Maniema (Belgian Congo). Thoughts on its development.**] *Bull. agric. Congo belge* 1959, **50,** No. 6, 1457–73, illus., Flemish summary.

952 Minelle, J. L'agriculture à Madagascar. [**Agriculture in Madagascar.**] [1959?], pp. 375, illus., maps, Paris : Lib. M. Rivière, 31, Rue Jacob. [Noted in *C.R. Acad. Agric. Fr.* 1959, **45,** No. 14]

953 de Fina, A. L. and others. Difusión geográfica de cultivos indices en las provincias de Catamarca y La Rioja y sus causas. [**Geographical distribution of index crops in the provinces of Catamarca and La Rioja and its causes.**] *Publ. 63 Sec. Agric. Ganad. Argentina* 1959, pp. 36, maps.

[See also *Fld Crop Abstr.* 12 : 951.] The localities surveyed in these two provinces during 1946–58 numbered 43. Maize is grown in all localities, barley in 38, wheat in 37, oats in 35 and cotton in 16.—E.B.O.

954 Boag, A. D. and Curtis, R. E. **Agriculture and population in the Mortlock Islands [Territory of Papua and New Guinea].** *Papua agric. J.* 1959, **12,** No. 1, 20–7, bibl. 1, illus.

Information is given on the agriculture of the Mortlock Islands where the principal crops are *Cyrtosperma chamissonis* (swamp taro), *Colocasia esculenta* and *Dioscorea esculenta.* Until recently *C. esculenta* was grown in swamp land ; the new method of growing this crop under much drier conditions has resulted in a considerable increase in yield.—E.B.O.

## LAND USE

955† Whyte, R. O. and Taylor, B. W. **A comprehensive approach to land classification.** *Internat. Seminar Land Develop. for agric. Uses, Wageningen, 25 Aug.-12 Sept., 1958, Publ. FAO/59/4/2422,* pp. 11. [Received July, 1959]

956† Pereira, H. C. **A physical basis for land use policy in tropical catchment areas.** *Nature, Lond.* 1959, **184,** No. 4701, 1768–71, bibl. 11. [E. Afr. Agric. For. Res. Org., Muguga, Kenya]

957† Taylor, B. W. **Land potential of the Puerto Cabezas—Río Coco area [Nicaragua].** *Publ. FAO/58/8/5967* 1958, pp. 49. [Received July, 1959]

Information is given on the climate (humid tropics), vegetation (savannas and forests), and land use in the Puerto Cabezas-Río Coco area, of about 5200 sq. miles. Recommendations are made for future development.—E.B.O.

958† Morland, R. T. **Erosion survey of the Hume catchment area. 5. Land use and fire damage.** *J. Soil Conserv. N.S.W.* 1959, **15,** No. 3, 208–26, bibl. 13, illus., 2 maps.

[See also *Fld Crop Abstr.* 12 : 466 and 1598 ; 13 : 469 and 978.]

959† Muto, M. and others. **Study on the regional structure of agriculture production and the classification method in Kanto-Tosan district.** [Japanese] *J. Kanto-Tosan Agric. Exp. Sta.* 1959, No. 14, pp. 363, illus., English summary.

## LAND RECLAMATION

960 Lodi, G. La bonifica della piana di Zula (Eritrea). [**Reclamation of the Zula plain (Eritrea).**] *Riv. Agric. subtrop.* 1959, **53,** No. 7–9, 273–85, bibl. 9, illus.

Information is given on works in progress to irrigate the arid Zula plain, where about 6000 ha are suitable for cultivation.—E.B.O.

961 van Parys, A. Les cultures en marais drainés en Ituri. [**The crops on the drained marshes in Ituri (Belgian Congo).**] *Bull. Inform. I.N.É.A.C.* 1959, **8,** No. 6, 375–90, bibl. 1, illus. [Sta. Rech. Agron., Nioka]

The drained marshy soils of the Ituri are suitable for crops of a growth period of less than 8 months, such as maize, sorghum, *Eleusine coracana* and *Amaranthus caudatus.*—E.B.O.

962† Garcia, J. A. S. O vulcão dos Capelinhos e alguns aspectos da recuperação das terras cobertas com as cinzas. [**The volcano of Capelinhos (Faial, Azores) and some aspects of the reclamation of land covered with ash.**] *Agricultura, Lisboa* 1959, No. 1, 26–30, illus.

In the island of Faial, 4652 ha have been covered by ash from the erupting volcano. A brief account is given of plot trials to study the possibility of reclaiming this land.—E.B.O.

963† Carlin, B. F. **Clearing sandplain country.** *J. Dep. Agric. W. Aust.* 1959, **8,** No. 5, 573–7, illus.

The reclamation of sandplain country by burning the existing cover, cultivation, cropping with cereals and stubble-burning is described.—S.M.J.

# FARMING SYSTEMS AND PRACTICES

*See also Abs. 1009, 1032, 1033.*

964† Macaulay, A. **Farming in the north-east of Scotland.** *Agric. Progr.* 1958, **33,** pp. 65–7, bibl. 1.

The development of the counties of Aberdeen, Banff and Kincardine in the north-east of Scotland as a stock-rearing and feeding area is discussed.—S.M.J.

965 Hansen, L. R. and Aastveit, K. Forgrødeforsøk på fotsykesmittet jord. **Rotation experiments on foot-rot infested soil.** *Forskn. Fors. Landbr.* 1959, **10,** No. 2, 89–126, bibl. 15, illus., English summary.

In a series of experiments in S.E. Norway during 1955–7, oats and/or an oil-seed crop (winter rape [*Brassica napus* var. *oleifera* subvar. *biennis*], winter turnip rape [*B. campestris* var. *oleifera* subvar. *biennis*] or white mustard [*Sinapis alba*]) were introduced into a system of continuous cultivation of barley or wheat on soils infested with take-all [*Ophiobolus graminis*] and eyespot [*Cercosporella herpotrichoides*]. After 2 years of cultivation of oats and oil-seed crops, barley yields were increased by an average of 26 kg/decare and the incidence of attack on barley and spring wheat was reduced by 32·8 and 17·8%, respectively. Undersowing Øtofte Res. III red clover in barley increased yields of grain and straw by 83 and 111 kg/decare, respectively and reduced the incidence of take-all, but increased that of eyespot. On sandy soils, undersowing red clover with an early-maturing 6-row barley variety is recommended. It is considered that the inclusion of oats and/or oil-seed crops in the rotation will increase barley yields on infested soils, and that on sandy soils, a non-susceptible crop should be grown every 2nd year and every 3rd year on heavier soils. F. Eng. s.—S.M.J.

966† Klapp, E. Mäheklee oder Weidekleegras? Ein, zwei- oder dreijähriger Futterbau in der Fruchtfolge? [**Mown clover or clover/grass pasture? One, two or three years of fodder crops in the rotation?**] *Z. Acker- u. PflBau* 1959, **109,** No. 1, 1–32, bibl. 24, English summary. [Versuchsgut Dikopshof, Inst. PflBau, Univ. Bonn, W. Germany]

In a series of plots under a 6-year rotation, fodder crops were introduced for 1, 2 and 3 years either as a clover/grass pasture or as a mown clover (or lucerne) crop. The arable crops in the rotation were oats, wheat, rye and sugar-beet. Yields of the fodder crops, their effect on the soil (plant residues and changes in physical structure and chemical composition of the soil), and yields of the following crops were investigated. Results are presented in over 30 tables. Fodder yields were greater from mown clover than from clover/grass pastures, and in both cases, were highest in the second year. On the whole, the clover/grass ley had a better effect on the soil than had the mown clover, but the effect was slight and of short duration. The differences in yields of crops following 1-yr mown clover in the 6-yr rotation (the system practised in Dikopshof) and following 2 or 3 years of clover/grass were slight. They varied (in kg/ha) between +1700 and −3400 for sugar-beet roots, +210 and −300 for wheat grain, and +350 and −360 for rye grain. These gains, where they occurred, were far below those obtained under ley farming in England and were not sufficient to warrant a change in the cropping system from the present, satisfactory, 1-year fodder break of mown clover. The author discusses the reasons for the differing results in England and Germany.—D.B.

967† LUPINOVIČ, I. S. **[A rational system of agriculture in the collective and State farms of White Russia.]** [Russian] *Zemledelie (Agriculture, USSR)* 1959, **7**, No. 10, 3–10.

A description is given of the various crop rotations practised in different provinces of White Russia.—M.H.

968 CHAMBERS, P. C. **Progress with mixed farming in the Northern Region, Nigeria.** *Pap. 4 Rep. Conf. Dirs and Sen. Off. Overseas Deps Agric. and Agric. Instns, London, Sept. 1958 (Misc. Publ. 531 Colon. Off.)* 1958, 24–32.

969† PATHAK, S. S. **A review of research on dry farming in India.** *J. Soil Wat. Conserv. India* 1958, **7**, No. 1, 34–8, bibl. 11.

This is a brief review of the literature on bunding, improved tillage methods, manuring, crop rotations, fallowing, strip cropping, and contour cultivation as practised in Bombay State, Hyderabad, Punjab and Uttar Pradesh.—D.B.

970† HAISE, H. R. **Agronomic trends and problems in the Great Plains. 6. Irrigation.** *Advane. Agron.* 1958, **10**, 47–56, illus. [USDA, Fort Collins, Colorado]

Yields of arable and forage crops under dry land conditions and under irrigation are compared and the availability of water for irrigation purposes is indicated. Some methods of irrigation are described. A table is given showing the amount of water required in various localities for irrigating lucerne, sugar-beet, potatoes, maize, and other cereals. [See *Abs.* 994.]—R.B.

971† REPARAZ, G. de. El programa de estudios de la zona árida peruana. **[The programme of studies on the Peruvian arid zone.]** *Publ. UNESCO* [n.d.], pp. 12, illus., English summary.

Information is given on a programme to study the possibility of developing irrigation in the arid zone of Peru, which consists of a narrow desert coastal fringe cut by a series of fertile valleys.—E.B.O.

972 STORK, C. **Evapotranspiration problems in Iraq.** *Neth. J. agric. Sci.* 1959, **7**, No. 4, 269–82, maps 1.

The Dujailah Experimental Station was set up in 1955 to study problems connected with the control of salinity on saline and alkali soils and their reclamation in Iraq. The net irrigation requirements of crops of barley and green gram (*Phaseolus aureus*) grown at this Station were in general agreement with figures derived from Penman's evapotranspiration equation. Penman's formula gave more reliable estimates of evapotranspiration than did those of Thornthwaite or Blaney and Criddle. Points for further study are indicated.—R.B.

973 NYE, P. H. **Plant nutrients in some indigenous systems of agriculture.** *Pap. 7 Rep. Conf. Dirs and Sen. Off. Overseas Deps Agric. and Agric. Instns, London, Sept. 1958 (Misc. Publ. 531 Colon. Off.)* 1958, 43–7.

The results from 9-years' fertilizer trials in Ghana have shown that the N release from land cleared from well grown secondary forest is sufficient for maize and cassava during the whole 9-year period, but in savannah country, cereals (though not yams) have responded to N. P deficiencies have appeared in both forest and savannah country within 1 or 2 years of clearing. K deficiency was marked in maize and cassava in rain forest after about 4 years, but in savannah country, where leaching is less and where the amount of unweathered minerals is higher, no K shortages have emerged.—M.A.

974† INSTITUT NATIONAL POUR L'ÉTUDE AGRONOMIQUE DU CONGO BELGE. **[Green manures.]** *Rep. INÉAC 1958*, 1959, 399. [Centre Plan. Agric. de la Lufira, Sta. de Simama]

A mixture of *Crotalaria usaramoensis*, *C. juncea* and *C. striata*, ploughed-in after 7 months of growth, yielded 19,880 kg green matter/ha ; *Mucuna atropurpurea* sown in maize stubble yielded 5750 kg green matter/ha after 3·5 months ; *Pennisetum purpureum* var. Keyberg yielded 48,000 kg green matter/ha after 13 months.—E.B.O.

# SOIL AND WATER CONSERVATION

975 Hide, J. C. **Agronomic trends and problems in the Great Plains. 4. Soil moisture conservation.** *Advanc. Agron.* 1958, **10**, 23–36. [Montana State Coll., Bozeman]

This review of soil-moisture conservation practices is treated under the following heads : efficiency of summer fallowing ; rainfall characteristics ; stored moisture and crop yields ; weed control ; losses of water by percolation ; use of water in transpiration ; control of runoff ; erosion by water ; evaporation ; the influence of climatic factors, crop residues, plant population, fertilizers and rotational practices on moisture conservation. [See *Abs.* 994.]—R.B.

976† Adams, J. E. and others. **Interpretations of runoff and erosion from field scale plots on Texas blackland soil.** *Soil Sci.* 1959, **87**, No. 4, 232–8, bibl. 15. [Texas Agric. Exp. Sta.]

An investigation was carried out during 1952–7 to compare the effects on runoff and erosion of the following cropping systems : (a) 1 yr cotton/1 yr maize, changed to continuous maize in 1956 ; (b) 1 yr maize/1 yr oats with sweet clover [*Melilotus* sp.] ; (c) 1 yr maize/2 yr fescue-grass [*Festuca* sp.] with sweet clover. Soil under a row crop of maize following close-drilled or broadcast crops of oats with sweet clover or fescue-grass with sweet clover was significantly less erodible and had less runoff than soil continuously row-cropped. Annual runoff and erosion were usually low on plots under oats, fescue-grass and sweet clover.—E.B.O.

977 Miller, H. C. **The role of surveys in planning agricultural development in Jamaica.** *Pap. 3 Rep. Conf. Dirs and Sen. Off. Overseas Deps Agric. and Agric. Instns, London, Sept. 1958 (Misc. Publ. 531 Colon. Off.)* 1958, 19–32.

Through the use of planned agricultural surveys and with the help of agricultural extension staff a start was made in 1951 in rehabilitating, and controlling erosion in, the Yallaks River Area; this scheme was extended to other areas in 1954 and 1955.—M.A.

978† Morland, R. T. **Erosion survey of the Hume catchment area. 4. Vegetation.** *J. Soil Conserv. N.S.W.* 1959, **15**, No. 2, 172–86, bibl. 10, illus.

The ecology of the distribution of virgin climax vegetation in the catchment area and the disclimax vegetation arising from the clearing and cultivation of parts of the area, are described. Reduction of catchment efficiency has accompanied depletion of cover and consequent soil erosion. [See *Fld Crop Abstr.* 12 : 1598 and 13 : 469.]—S.M.J.

979 Aiyadurai, S. G. **Wild species of *Arachis* as forage and soil binding plants.** *Indian Oilseeds J.* 1959, **3**, No. 3, 149–51, bibl. 1, illus. [Agric. Res. Inst., Coimbatore]

A brief account is given of the growth habit, flowering, vegetative multiplication, fodder yields and nutritive value of wild species of *Arachis* including *A. marginata* and *A. glabrata.* The wild species are superior to *A. hypogaea* in nutritive value. They are drought resistant and perennial and multiply vegetatively. Their roots and rhizomes bind soil while their tops provide good ground cover.—D.B.

# AGRO-METEOROLOGY AND CLIMATOLOGY

*See also Abs. 972.*

980† Mohrmann, J. C. J. and Kessler, J. **Water deficiencies in European agriculture. A climatological survey.** *Publ. 5 Internat. Inst. Ld Reclam. Improve.* 1959, pp. 60, bibl. 20, maps 10, French, German and Spanish summaries.

From data obtained by 287 meteorological stations throughout Europe, maps were compiled showing : the precipitation deficit during (a) Jan.–June, (b) July-Sept., (c) the period of growth of winter wheat ; the average precipitation surplus during winter ; the average annual duration of precipitation deficits ; average annual potential evapotranspiration ; the frequency of water shortages where the soil contains 50, 100 or 200 mm of water readily available to crops. The significance of the data is briefly discussed with reference to soil characteristics, cropping and irrigation.—R.B.

981 Lawes, D. A. **Rainfall and percolation studies at Samaru.** *W. Afr. Cotton Res. Conf., Samaru, N. Nigeria 1957.* [n.d.], 193–6, bibl. 3.

The effects are discussed of rainfall intensity and rates of percolation at Samaru where the very wet conditions of September followed by arid conditions in November inhibit cotton growth and result in low yields.—S.M.J.

982 Garnier, B. J. **Potential evapotranspiration and its use in agricultural development.** *W. Afr. Cotton Res. Conf., Samaru. N. Nigeria 1957.* [n.d.], 197–204, bibl. 20.

983† Giacobbe, A. Ricerche ecologiche sull'aridità nei paesi del Mediterraneo occidentale. [**Ecological investigations on aridity in the countries of the western Mediterranean.**] *Webbia* 1958, **14,** No. 1, 81–159, bibl. in text, French summary.

With regard to the European and African countries of the western Mediterranean, the possibility was studied of determining a theoretical measure of summer aridity, which is the most important characteristic of all the Mediterranean climates. The index of summer aridity proposed gives a relative measure of aridity when comparison is made between two, or more, localities. By means of this index, and of a winter thermic index, the territory under study is divided into 4 Mediterranean sub-climates : warm, tepid, temperate and cold ; each of these sub-climates is subdivided into 5 types : Saharian, arid, semi-arid, sub-humid and humid. F. s.—E.B.O.

984† Pereira, H. C. **Practical field instruments for estimation of radiation and of evaporation.** *Quart. J. R. met. Soc.* 1959, **85,** No. 365, 253–61, bibl. 17, illus.

An improved Gunn-Bellani radiation integrator with a thermal efficiency of over 75% is described. It is considered that in the high-altitude tropics, this instrument can provide basic data for estimating water use by vegetation and for controlling irrigation. F. s.—S.M.J.

985 Jenny, J. Quelques données techniques sur les méthodes de lutte contre le gel. [**Some technical information on methods of counteracting frost.**] *Landw. Jahrb. Schweiz* 1958, **72,** 557–74, bibl. 24, illus. [Sta. Fédérales d'Essais Agric., Lausanne]

The physics of counteracting frost damage, especially from night frost, is discussed. Reference is made to the protection of vegetation from frost by using instruments which (a) cause air movement, (b) heat air, (c) emit water vapour. The paper is concerned mainly with the principles, practice and costs of sprinkler irrigation for protecting vegetation from frost damage. An electrical device for giving a frost alarm is described and illustrated.—D.B.

986 Jarman, R. T. **The microclimate in stands of irrigated cotton (*Gossypium barbadense*).** *J. Ecol.* 1959, **47,** No. 2, 499–510, bibl. 9.

The relationships between insect-pest populations, environmental conditions, spraying and cropping practices are being studied at the Gezira Research Farm, Wad Medani, Sudan. Details of the microclimate in irrigated cotton there during Nov. and Dec. 1956 are recorded.—M.H.

987† Steffensen, Ester. Mikroklimatologiske undersøkelser og tilvekstmålinger av gulrot på Statens Forsøksgard Kvithamar i tiden 4. August– 22 Oktober 1947–56. **Microclimatological investigations and growth measurements of carrot crop at the State Experiment Station Kvithamar in the period 4. August–22. October 1947-56.** *Forskn. Fors. Landbr.* 1959, **10,** No. 1, 57–87, English summary, illus. [Statens Forsøksgard Kvithamar, Stjørdal, Nord Trøndelag, Norway]

Data are given of temperatures at different heights above ground and at different soil depths, relative humidity and solar radiation on carrot crops at Kvithamar (63° 29′ N. long., 10° 53′ E. lat.) in the Nord Trøndelag province of Norway.—P.J.B.

988† Kristensen, K. J. **Temperature and heat balance of soil.** *Oikos* 1959, **10,** No. 1, 103–20, bibl. 29. [Hydrotech. Lab., R. Vet. Agric. Coll., Copenhagen]

Measurements were made of the temperature at depths ranging from 2·5 to 150 cm under bare soil and from 2·5 to 700 cm under short grass swards during 1955–7 near Copenhagen. Calculations were made of the soil-heat balance.—P.J.B.

989† Guimarães, C. O clima da Guiné Portuguesa. [**Climate of Portuguese Guinea.**] *Bol. cult. Guiné portug.* 1959, **14,** No. 55, 295–357, map.

990† Kimball, M. H. and Brooks, F. A. **Plant climates of California.** *Calif. Agric.* 1959, **13,** No. 5, 7–12, maps 1.

A map of the climatic regions of California and tables showing the effective day and night temperatures in each region for each month of the year are given.—R.B.

991† Dupriez, G. Le réseau d'écoclimatologie de l'INÉAC. [**The ecoclimatological network of I.N.É.A.C.**] *Bull. Inform. I.N.É.A.C.* 1959, **8,** No. 5, 283–301, illus.

About 60 ecoclimatological stations have been established by I.N.É.A.C. in the principal natural regions of the Belgian Congo and Ruanda Urundi. They are situated on flat ground covered with a short, drought-resistant grass. *Paspalum notatum* has been found satisfactory wherever used. Information is given on observations made and on the co-ordination of work among stations.—E.B.O.

992† Air Ministry Meteorological Office, Great Britain. **Tables of temperature,**

**relative humidity and precipitation for the world. 3. Europe and the Atlantic Ocean north of 35°N.** *Bull. M.O. 617c.* 1958, pp. x + 160, illus, London H.M.S.O., 24 × 15 cm, 14s. 0d.

993† Institut National pour l'Étude Agronomique du Congo Belge. Bulletin climatologique annuel du Congo belge et du Ruanda-Urundi, année 1958. [**Annual climatological bulletin of the Belgian Congo and Ruanda Urundi, 1958.**] *Comm. 18 Bur. Climatol. INÉAC* 1959, pp. 189. [Bruxelles]

## MISCELLANEOUS

994 Olson, R. V. and others. **Agronomic trends and problems in the Great Plains** [USA]. *Advanc. Agron.* 1958, **10,** 1–66, bibl. 168, illus, 2 maps.

*See Abs. 949, 970, 975.*

995† Schmitt, N. Das Tonband im Dienste der Schadvogelbekämpfung. [**Tape recordings for controlling undesirable birds.**] *Gesunde Pfl.* 1959, **11,** No. 2, 32–8, bibl. 9, illus. [Mainz, W. Germany]

Bird-scaring tests, using the 'Phonoakustik' apparatus were carried out in vineyards in the Rhineland Palatinate. The alarm signal (unique for each species) was broadcast for starlings. The signal should be given for spells of 15–30 sec. and broadcast for a total of not more than 4–5 min. in any hour. Young starlings do not react as readily as older birds ; in complete darkness starlings do not budge. The apparatus must record and emit a pure tone because birds recognize any sound distortion. Birds must be scared at both feeding and resting places. The apparatus can be used for scaring crows from wheat and maize fields and birds from buildings.—D.B.

996† Druns, H. Neue Erfahrungen zur Starenabwehr mittels Tonband. [**Recent experience in scaring starlings with tape recordings.**] *Gesunde Pfl.* 1959, **11,** No. 8, 151–2. [Staatl. Vogelschutzwarte, Hamburg, W. Germany]

The alarm note gives a better result than the anxiety note and it has more effect on birds on the wing than when they are at rest.—D.B.

997 Haylock, J. W. **Investigations on the habits of quelea birds and their control.** 1959, pp. 16, bibl. 2, illus., 1 map. Nairobi : Dep. Agric., Kenya.

The use of birdlime and of ultrasonic sound radiation gave some control of *Quelea* over small areas, but aerial spraying of roosts with contact poisons and destruction of nesting colonies by flame-throwing were the most promising control methods.—A.M.H.

998 Klemm, M. Meldedienst, Prognose und Warndienst im Pflanzenschutz. [**Reporting service, prognosis and warning service in plant protection.**] *NachrBl. dtsch. PflSchDienst. Braunschweig* 1959, **11,** No. 1, 1–9. [Biol. Bundesanst., Dienststelle für Melde- und Warndienst, Berlin-Dahlem]

An account is given of the way in which these services function.—D.B.

999† Schwan, B. Biskydd och växtskydd i Sverige. **Bee protection and plant protection in Sweden.** *Särtryk och Förhandsmedd. No. 134, Stat. Husdjursförsök, Uppsala* 1959, pp. 13, English summary.

Risks of poisoning bees through the use of insecticides and herbicides in Sweden are reviewed. Most cases of bee-poisoning are at present caused by contact insecticides, especially BHC and parathion and are mainly confined to cruciferous oil seed crops. These crops require the extensive use of insecticides to control such pests as pollen beetle (*Meligethes aeneus*), swede seed weevil (*Ceutorrhynchus assimilis*), and turnip sawfly (*Athalia colibri*). Pollen beetles can be controlled with DDT applied before flowering, while the remaining 2 species can be controlled with pyrenon and dipterex, respectively ; all these insecticides are relatively harmless to bees.—P.J.B.

1000† Bärner, J. [Ed.] Bibliographie der Pflanzenschutzliteratur, 1950. [**Bibliography of plant protection literature, 1950.**] 1956, pp. 438. Bibliographie der Pflanzenschutzliteratur, 1951. 1955, pp. 420.
Bibliographie der Pflanzenschutzliteratur, 1952. 1959, pp. 433. West Berlin : Verlag Paul Parey. [Biol. Bundesanst. für Land- u. Forstwirtsch. in Berlin-Dahlem]

[For earlier volumes see *Fld Crop Abstr.* 7 : 717, 11 : 421 and 12 : 531.]—D.B.

1001† Cooke, G. W. **Fertilizers, crop production and soil fertility.** *J. Fmrs' Cl., Lond.* 1959, Pt. 5, 50–67.

Information on the relationships between fertilizers, crops and soil in Gt Britain is brought together in simple " balance-sheet " form. Modern cereal varieties require much more N than their predecessors and a modern cash-cropping rotation

consumes many times more fertilizer than the old Norfolk 4-course rotation. Although leys conserve organic matter, under any system of management for production they lose more potash than is lost by arable cropping. The use of N and K has increased 5-fold in the last 20 years and it is concluded that crop production can be raised profitably to still higher levels by the use of fertilizers as a supplement to good husbandry.—J.D.J.

1002† Walsh, T. and others. **A half-century of fertilizer and lime use in Ireland.** *J. Soc. for Statist. and Social Inquiry.* 1957, **19**, 104, bibl. 6.

The use of fertilizers and lime in Ireland over the past 50 years is discussed, and their potentiality for increasing production reviewed. Recommended N, P, K and lime applications for potatoes, mangels, swedes, oats, wheat, barley, pasture and hay are given.—S.M.J.

1003 Russell, E. W. **The fertility of tropical soils.** *Pap. 5 Rep. Conf. Dirs and Sen. Off. Overseas Deps Agric. and Agric. Instns, London, Sept. 1958 (Misc. Publ. 531 Colon Off.)* 1958, 33–40.

1004† Webb, R. A. **Problems of fertilizer use in tropical agriculture.** *Outlook on Agric.* 1959, **2**, No. 3, 103–13, bibl. 12, illus.

Methods for diagnosing mineral deficiencies in soils visually or by testing the responses of indicator plants, as used in temperate areas, are not always applicable to tropical areas where multiple deficiencies may occur. The subtractive method tested at the Experimental Farm, Yundum, Gambia in 1954 is described. Selected indicator plants, including lucerne, maize and groundnuts, were pot-grown in the soil to be examined. The following treatments were applied : (a) a nutrient solution containing all known macro- and micro-elements, (b) as (a), but lacking each element in turn, (c) water. A comparison of (a) and (c) with (b) indicated individual deficiencies in the soil. Thus multiple deficiencies could be assessed for any given soil. An objective assessment of deficiency was made by comparing the weights of plants supplied with all nutrients with those receiving deficiency treatments. After growth for 5–6 weeks, aerial portions of the plants were harvested, dried and weighed. Dried weights were expressed as percentages of the weight of the plant grown with complete nutrient and an arbitrary scale of deficency (given in the text) was evolved.—S.M.J.

1005† Maclet, J. N. and Barrau, J. Catalogue des plantes utiles aujourd'hui présentes en Polynésie française. [**Catalogue of useful plants present in French Polynesia.**] *J. Agric. trop. et Bot. appl.* 1959, **6**, No. 1–3, 1–21 and No. 4–5, 161–84, bibl. 40.

1006† Institutionen för Växtodlingslära, Sweden. Forskning och undervisning vid Institutionen för växtodlingslära 1934–1959. **Research and teaching at the Department of Plant Husbandry 1934-9.** *Växtodling* 1959, No. 14, 7–38, English summary.

A review is given of crop husbandry research conducted by the Department of Plant Husbandry of the Royal School of Agriculture, Uppsala. It includes an account of work on the following subjects : crop rotations ; weeds and their control ; plant growth-regulating substances ; pastures, cereal, pulse and oil-seed crops ; potatoes, seed production and phytopathology.—P.J.B.

1007 National Institute of Agricultural Botany, Cambridge. **Guide to varieties of field and vegetable crops under trial, observation and propagation. 1959.** NIAB Cambridge [n.d.] [Received Nov. 1959]

1008† OEEC. **The small family farm, a European problem. Methods for creating economically viable units.** *Proj. 199/2 OEEC* 1959, pp. 103, bibl. in text.

1009† Yang, W. Y. **Methods of farm management investigations for improving farm productivity.** *Agric. Devel. Pap. 64 FAO* 1958, pp. 228, bibl. 77.

1010† OEEC. **Cost-return relationships in agriculture.** *Proj. 392 EPA/OEEC* 1959, pp. 73.

This report surveys the methods used for establishing input-output relationships in 13 OEEC member countries.—E.B.O.

1011† Angladette, A. Notes sur l'économie agricole du Ruanda Urundi. [**Notes on the agricultural economy of the Ruanda Urundi.**] *Agron. trop., Paris* 1959, **14**, No. 5, 572–99, bibl. 33, illus.

1012 Savile, A. H. and Hughes-Rice, T. **Extension methods in African areas in Kenya.** *Pap. 10 Rep. Conf. Dirs and Sen. Off. Overseas Deps Agric. and Agric. Instns, London, Sept. 1958 (Misc. Publ. 531 Colon. Off.)* 1958, 68–77.

1013 Friedberg, Claudine. Contribution à l'étude ethnobotanique des tombes précolombiennes de Lauri (Pérou). [**A contribution to an ethno-botanical study of the pre-Colombian tombs of Lauri (Peru).**] *J. Agric. trop. et Bot. appl.* 1958, **5**, No. 6–7, 397–428 and 1959, **6**, No. 8–9, 405–35, bibl. 105, illus.

The plant material studied, found in the pre-Colombian tombs of Lauri, included : maize ears; pods containing seeds of groundnuts, *Inga feuillei*

and *Caesalpinia* sp. ; seeds of *Canavalia ensiformis* and *Phaseolus* spp. ; a pod of *Mucuna* sp. (?); seeds and fruits of cotton (*Gossypium barbadense*) and cotton for spinning.—E.B.O.

1014† OEEC. **List of agricultural press and periodicals in OEEC member countries.** *Doc. Ser. 11 OEEC* 1959, pp. 107, text in English and French.

## REPORTS

1015 **Great Britain.** Pea-growing Research Organisation Ltd., Annual Report 1958. Yaxley, 1959, pp. 28, 1s. 6d.
*See Abstract 733.*

1016 **Great Britain.** Report of a Conference of Directors and Senior Officers of Overseas Departments of Agriculture and Agricultural Institutes held at Wye College, Kent. 1958. *Misc. Publ. 531, Colon. Off. London,* pp. 169.
*See Abstracts 968, 973, 977, 1003, 1012.*

1017 **Netherlands.** Commissie ter Bevordering der Suikerbietenteelt in de Noordelijke Provinciën. Rapport over 1957. [Report, for the year 1957, of the Commission for the promotion of sugar-beet cultivation in the Northern Provinces.] *Meded. Inst. rat. Suikerprod,* 1958, **28**, No. 2, 57–148, illus.
*See Abstracts 745, 746, 747, 748, 754, 755, 775.*

1018 **Netherlands.** Instituut voor Biologisch en Scheikundig Onderzoek van Landbouwgewassen, Wageningen. Jaarboek 1959. [Institute for Biological and Chemical Research on Field Crops and Herbage, Wageningen. Yearbook 1959.] 1959, pp. 180, illus.
*See Abstracts 564, 565, 566, 728, 729, 764, 777, 799, 942, 943.*

1019 **Federation of Nigeria.** Annual Report on the Department of Agricultural Research 1957–8. Lagos, 1959, pp. 43.
*See Abstracts 815, 819.*

1020 **Nigeria.** West African Cotton Research Conference. Samaru, N. Nigeria. November 1957. Min. Agric., Samaru, N. Nigeria, [n.d.], pp. 209, 15s. [Received September 1959]
*See Abstracts 826, 827, 829, 837, 839, 845, 981, 982.*

1021† **Belgian Congo.** Institut National pour l'Étude Agronomique du Congo Belge. Rapport annuel pour l'exercice 1958. [Annual report for 1958.] Bruxelles, 1959, pp. 529.
*See Abstracts 536, 597, 612, 646, 662, 716, 785, 811, 816, 828, 862, 932, 961, 974, 991, 993, 1021.*

1022 **South Africa.** Agricultural Research Station, Barberton. Report on agronomy experiments 1956-7. [n.d.], mimeo. pp. 46. [Received August, 1959]
*See Abstract 851.*

1023 **Australia.** Tenth Annual Report of the Commonwealth Scientific and Industrial Research Organization for the year 1957–58. Canberra, 1958, pp. 174.

1024 **Australia.** Department of Agriculture of Western Australia. Annual Report for the year ending June 30, 1958. pp. 55, illus., 1 map. [Received Dec., 1959]
*See Abstracts 532, 653.*

1025 **Australia, Northern Territory.** Katherine Research Station. Progress Report 1946-56. C.S.I.R.O. Melbourne, 1959, pp. 60, illus.

The 2 functions of the station are (1) to examine the possibility of establishing agriculture in the area mapped by the Regional Survey as the Tipperary Land System, and (2) to serve as a type location for the study of dryland agriculture in the wider monsoon area of northern Australia. Katherine is 200 miles inland from Darwin, lat. 14°S., in flat country 355 ft a.s.l., with an annual rainfall of 35 in. falling in Dec.–March. The dominant vegetation is open *Eucalyptus* woodland with tall grass. The most successful dryland crops are groundnuts (one ton in shell/ac.) and grain sorghum (2000 lb./ac.) which is left standing until dry enough for harvesting with a header. Amongst minor crops, *Hibiscus* fibre has done well on the dryland farm and sesame (1000 lb./ac.) on the river levee. Groundnuts grown continuously have yielded more than groundnuts grown after sorghum or cotton. On the other hand, it is most necessary to grow sorghum in a rotation as the yield drops markedly when grown continuously, even if fertilizers are applied.—J.D.J.

# BOOKS

1026 Commonwealth Economic Committee, Intelligence Branch. **Grain Crops. No. 6.** A review of production, trade, consumption and prices relating to wheat, wheat flour, maize, barley, oats, rye and rice. 1959. pp. iv + 200, 24 × 18 cm, London : HMSO, 10s. 0d.

1027 Nagai, I. **Japonica rice, its breeding and culture.** 1959, pp. 843, illus., Tokyo : Yokendo Ltd. [Seen in *Internat. Rice Comm. News Lett.* 1959, **8**, No. 2]

A review of this book will be published in a later number of this journal.

1028† Gram, E. and others. **Recognition of diseases and pests of farm crops.** 1958, pp. 128, 22 × 15 cm, Copenhagen : The Danish Agricultural Information and Advisory Aids Service. 35s net.

During 1940–5, a series of 3 books dealing with the recognition of the pests and diseases of potatoes, root and seed crops was published in Denmark and a fourth dealing with cereal crops was prepared, but not published. These 4 books have now been combined into one and have been published by the Danish Agricultural Information and Advisory Aids Service under the present title. This book is intended both as a reference book for the use of students and as a guide to farmers in the recognition of the major pests, disease and mineral deficiencies of Danish farm crops. It contains 112 colour plates, which contain a total of 720 illustrations almost all of which are of high quality, together with descriptive captions for each. As most of the pests and diseases illustrated are common to all western European countries, separate editions have been prepared, each containing Danish and English versions of the descriptive captions, but a third version in Swedish, Dutch, German or French, respectively. There are subject indexes in each language and an index of scientific names.—P.J.B.

1029† Howarth, W. O. and Warne, L. G. G. **Practical botany for the tropics.** 1959, pp. 238, illus., Univ. London Press, 15s.

This is a laboratory manual with a difference, the difference being that the plants employed to illustrate the various aspects of plant life are available in the tropics. The contents are those usual in an elementary course, namely laboratory instructions for studying morphology, anatomy, reproduction and physiology, but the sequence is unusual and appears to be illogical. For example, some of the physiological studies are inserted between morphology and anatomy ; osmosis and permeability are separated, by several chapters, from water absorption and its transport. The chapters on cryptogams would have been more useful if provided with illustrations, which are a good feature of the rest of the book. Double-staining techniques have been omitted. This seems a pity because the manual is intended for practical work up to the English General Certificate of Education at Advanced Level and for the "early years of a University course."—D. Brown.

1030† Verdeyen, J. Pour mieux comprendre et mieux raisonner la fumure des prairies pâturées en particulier et des plantes de grande culture en général. [**For a better understanding and reasoning about the manuring of grazed meadows in particular, and of field crops in general.**] Vol. 1, [n.d.], pp. 328, 25 × 17·5 cm, Bruxelles : Cent. Nat. Rech. Herb. Fourrag. [Received Nov., 1959]

A wide study has been undertaken to investigate the influence of soil and manuring on the yield and chemical composition of cultivated plants. The object of this first volume was to present basic data on the nutrition, growth and development of plants. The volume is concerned with 2 trials in which seed development and bud development were studied and with another trial in which *Lolium perenne* PVS Kaloï pasture type, *Festuca pratensis* PVS Melle and spring wheat Précoce de Gembloux were grown in the field on sandy soil with the same manurial treatment. The results obtained indicate that : a growing plant behaves as a mathematical entity in progressive and continuous evolution ; the chemical composition of a plant can vary within wide limits. The effect of the principal nutrients, alone or in association, on the composition and yield of a plant will be the subject of a further volume.—E.B.O.

1031† Machlis, L. and others [Eds]. **Annual review of plant physiology.** Vol. 10. 1959, pp. 483, 22 × 15 cm, Palo Alto, California : Annual Reviews Inc., $7·50.

The following papers are noted : (1) Foliar absorption of mineral nutrients. By S. H. Wittwer and F. G. Teubner, pp. 13–22. (2) Leaf proteins. By N. W. Pirie, pp. 33–52. (3) Active transport of salt into plant tissues. By G. G. Laties, pp. 87–112. (4) Respiratory mechanisms in higher plants. By D. P. Hackett, pp. 113–46. (5) Photoperiodic control of floral induction. By J. Doorenbos and S. J. Wellensiek, pp. 147–84. (6) Fat metabolism in higher plants. By P. K. Stumpf and C. Bradbeer,

pp. 197–222. (7) The macronutrient elements. By T. C. Broyer and P. R. Stout, pp. 277–300. (8) The chemical regulation of growth. Some substances and extracts which induce growth and morphogenesis. By F. C. Steward and E. M. Shantz, pp. 379–404.—R.B.

1032 Norman, A. G. [Ed.] **Advances in Agronomy. Vol. 10.** 1958, pp. 547, 22·5 × 15 cm, New York : Acad. Press Inc.

In a section of the above entitled " Agronomic trends and problems in the Great Plains", the following papers are noted : Field crops, by E. G. Heyne, pp. 8–15 [Abs. 949] ; Soil moisture conservation, by J. C. Hide, pp. 23–36 [Abs. 975] ; Irrigation, by H. R. Haise, pp. 47–56 [Abs. 970]. Other papers include : Safflower, by P. F. Knowles, pp. 289–323 [Abs. 869]; Corn plant population in relation to soil productivity, by G. W. Dungan and others, pp. 435–73 [Abs. 608].—R.B.

1033† Symon, J. A. **Scottish farming : past and present.** 1959, pp. 434, illus, 23 × 14 cm, Edinburgh : Oliver and Boyd, 42s.

Within its small land area, Scotland shows great diversity of geological and geographical structure, while its lively history and rapid industrialisation has had important local and national effects. These and many other factors have all contributed to the modern agricultural scene in Scotland and, taken in total, have given the rural historian a very tangled skein to unravel.

The author is to be congratulated on his success with the daunting task of filling a gap long felt by those interested in the agriculture and the social history of rural Scotland. Between the wars, and in the post-war years, several writers have dealt with parts of the story, but the present account spans the centuries from the " kitchen-middens " of the prehistoric colonists to the most recent developments and is written with the object of presenting the whole picture in some detail and in wide scope. His book will be most used, either as straight reading or as a source of reference, by those whose work brings them into intimate contact with the farming in Scotland, but it will be of interest to many others both within and beyond Scotland. The material is here for those in other countries who may wish to trace the course of technical and economic development from the 1700's, when Scotland was an agriculturally undeveloped country, to the present day when it has a world-wide reputation for the high standard of its agriculture and livestock.

The first 7 chapters deal briefly with food production in prehistoric and medieval times, with the countryside under feudalism and " The Dawn " of 1700–49, during which period the first improvements in farming were begun. Later chapters discuss the Highlands and Islands before the " Forty-Five " and from then until 1955. Mention is made of the emigrations and the Highland clearances during the late 1700's and early 1800's which had, as one of their effects, the flow of Highland emigrants to the new lands across the seas. Further chapters deal with farming improvements in the late 18th century, the contribution made by Scottish farming during both World Wars, and trends during the post-war period up to 1954. The remaining 10 chapters cover the history and development of particular aspects, including agricultural education and research, livestock- and grass-land-husbandry, the potato, farm implements and the agricultural co-operative movement.

The turning-point in the historical story was the revolution which took place in the countryside from the mid-18th to the mid-19th century—the change from the " old husbandry " to the new. It is fitting that this well documented record should appear now at a time when the methods then established are rapidly making way for still newer techniques of husbandry. —J. A. Gilchrist.

1034† Arakeri, H. R. and others. **Soil management in India.** 1959, pp. 604, bibl., illus., 22 × 14 cm, Bombay : Asia Publishing House, 82s. 6d.

This is a textbook written for University students in India. It begins with basic information on soil formation, soil testing, organic manures, mineral fertilizers and climate, and continues with soil management in relation to various farming practices such as rotations, tillage and its mechanization, irrigation, drainage and soil and water conservation. The remaining chapters deal with the management of soils for specific crops which include cereals, cotton, jute, oil-seed crops, potatoes, legumes and grass. Each of the 24 chapters ends with a list of references, a summary and questions. The book is written in a readable style and is abundantly illustrated with good line drawings and half-tone plates.—D.B.

1035 Ignatieff, V. and Page, H. J. [Ed.] **Efficient use of fertilizers.** *Agric. Studies 43 FAO* 1958, pp. 355, bibl. for each chapter, illus., 23 × 15 cm, Rome. Revised and enlarged edition.

Among the chapter heads are : ' Cropping systems and fertilizers ', and ' Crops, their soil and nutrient needs'. The crops considered include the principal cereals and legumes, potatoes, sweet-potatoes, sugar-beet, cassava and cotton. There is a subject index.—E.B.O.

1036 United Nations. Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, held in Geneva, 1–13 September, 1958. Vol. 27. **Isotopes in agriculture.** 1958, pp. 455, bibl. at end of

papers, illus., Geneva : United Nations, 28 × 22 cm, £5.

This volume is concerned mainly with plant physiology, soil studies, genetics and crop improvement. Among the papers presented were the following :

1. The utilization of calcium from different labelled compounds by plants. By A. Van Den Hende and others, pp. 3–7.
2. Effect of radiation on salt uptake in plants. By D. A. Barber and G. J. Neary, pp. 8–12.
3. The function of oxidative metabolism in the passage of ions into plants. By C. E. Hagen and S. B. Hendricks, pp. 19–22.
4. The use of radioactive isotopes in agriculture in South Africa. By P. G. Marais, pp. 23–30.
5. Research on the penetration of zinc into caryopses and seeds by treating them with $ZnSO_4$ marked with radioactive zinc-65. By R. Ripan and others, pp. 34–6. [See *Abs.* 616].
6. Absorption and distribution of labelled rubidium ions in young intact barley plants. By R. J. Helder, pp. 42–7. [See *Abs.* 603].
7. Application of radioactive isotopes to research in agrochemistry and soil science in Hungary. By J. di Gléria, pp. 63–7.
8. Periodicity in absorption and excretion by roots. By I. I. Gunar and others, pp. 74–84.
9. The relation between the absorption of radioactive phosphorus by agricultural crops and their resistance to frost. By V. I. Razumov and N. D. Feofanova, pp. 93–6.
10. The improvement of fertilizer dressing and soil management in the rice field. By S. Nishigaki and others, pp. 152–9.
11. The effect of irradiation on the branching of corn (maize) stalks. By M. R. Sarić, pp. 230–2.
12. The effects of radiation in plant nutrition experiments with radiophosphorus. By K. Steenberg, pp. 249–59. [*See Abs.* 917].
13. Physiological and genetic effects of ionizing radiation on some plants. By P. Lamarque and others, pp. 275–81.
14. The radiosensitive phase in plant germination. By R. Biebl, pp. 299–304.
15. Improved storage quality of potatoes, vegetables and fruit exposed to gamma radiation. By K. Mikaelsen and others, pp. 401–5.
16. Analytical study of potato tubers subjected to nuclear radiation. By Cent. Lab. Nation. Def. Establish., Paris, and Conservatome Soc., Lyon, pp. 434–6.
17. A study of the action of ionizing radiation on the metabolism of potato tubers in relation to the problem of their all-year-round storage. By B. A. Rubin and L. V. Metlitsky, pp. 437–43.—E.B.O.

# NEWS AND NOTES

## Great Britain

1037 POTATOES. A meeting on " The potato " was held by the Agriculture Group of the Society of Chemical Industry, London, on 13 Oct., 1959. The following is a brief summary of the 4 papers presented : Evaluation of British potato varieties, by N. McDermott. Since pre-war years, the position of varietal preference has completely changed in the early and second-early groups of potatoes to earlier-bulking kinds. Those varieties introduced during the last 20 years in the main-crop group have made no marked impact on Majestic and King Edward, which are still the leading varieties in England and Wales. In 1958, varying acreages of 74 varieties were certified for seed purposes in the UK, but 17 of these covered 87% of the total acreage. Potato haulm destruction, by H. P. Allen. Since 1955, trials have been carried out with a new preparation named diquat, which is promising as a potato haulm- and weed-killer. Indications are that on dense haulm 2 lb. diquat per ac. is effective. Manuring of potatoes, by D. A. Boyd. Manurial practices on British farms are discussed. Chemical aspects of discoloration in cooked potatoes, by J. C. Hughes. In joint work by the National Institute of Agricultural Botany, Cambridge, and the Low Temperature Research Station, Cambridge, a straight-line relationship was found, within individual sections of single tubers, between blackening and the chlorogenic acid/citric acid ratio. This relationship was still found to apply when several varieties grown at different centres were studied, but owing to the effect of other variables (such as iron) the relationship was not as perfect as within single tubers. The results, however, strongly indicate that the principal factors determining the level of blackening in potatoes are the concentrations of chlorogenic acid and citric acid. *Chem. and Industr.* 5 Dec. 1959, No. 49.—E.B.O.

1038 THE first issue of an annual journal, *The Journal of the Durham School of Agriculture, Houghall*, was received in February. It replaces the *Houghall Record*, which was last issued in 1957 and will contain information on the activities of the School of Agriculture and Houghall Farm and also articles by guest writers on topics of interest to farmers. —S.M.J.

1039† THE first number of a new quarterly journal, *International Journal of Abstracts, Statistical Theory and Method*, was published in mid-1959. It is published by the International Statistical Institute and covers all statistical journals and other publications of statistical interest. An alphabetical list of publications covered in the first number is given. The abstracts appear on colour-coded pages and are given

classification numbers and cross-references to facilitate indexing and filing.—S.M.J.

**Republic of Ireland**

1040† The Agricultural Institute of the Republic of Ireland was established under the Agricultural Act of 1958. The Institute now announces major developments in the organization of the Division of Plant Sciences and Crop Husbandry, which will provide a wide coverage in the plant sciences, and cater for research in plant pathology, entomology (including nematology), plant breeding, plant protection, plant quality, weed control, and other general aspects of crop husbandry. Mr. B. Crombie, at present in charge of the Plant Breeding Station of Cómhlucht Siúicre, Éireann, Teo. (Irish Sugar Company), at Thurles, Co. Tipperary, has been appointed chief of this Division. *Nature, Lond.* Dec. 12, 1959.—M.H.

**Netherlands**

1041† The Pulse Crop Study Group (Peulvruchten Studie Combinatie), founded in 1939, is not a commercial concern, but an association of scientists, breeders, growers, seedsmen and canners interested in the improvement, growing, processing and marketing of peas, beans and, more recently, lupins. Its activities are largely advisory, an important function being to " bring the results of research to the grower and to keep the scientist informed of practical problems". To celebrate the 20th year of its existence a symposium of articles is published under the title of "Twenty years PSC", 1959.—G.M.R.

**Italy**

1042 In many areas of the Po valley in the spring of 1959, wheat crops were infested by colonies of *Sitobion granarium* ; these were eventually controlled by the fungus, *Entomophthora muscivora*, which spread naturally. *Progresso agric.* 1959, **5**, No. 10.—E.B.O.

**USSR**

1043 Ivanov Agricultural Institute. In Dec. 1959, a copy of the Collection of Scientific Papers (14th issue) from the above Institute, published in 1956, was received by this Bureau. Among the works of interest are the following : (1) Yields from herbage seeds mixtures and their effect, when grown in crop rotations, on soil structure and fertility, by A. A. Plotnikov ; (2) Fertility of the soil in ley rotations following spring wheat, winter rye and potatoes, by A. A. Plotnikov and V. V. Makarova ; (3) Peculiarities of development in the inflorescences and florets in yellow lupin (for fodder) under different media, by O. N. Šalyganova ; (4) Effect of summer planting on seed quality of potatoes, by A. N. Orlova ; (5) The depth of the tillering node in winter wheat, by M. V. Volkovoĭ ; (6) Square-pocket planting of potatoes, by A. N. Krytikov.—M.H.

**International**

1044† OEEC. An Economic Conference was held in Paris in Jan. 1960 and was attended by representatives of 11 member countries of OEEC and of the USA and Canada (both associate members of OEEC), as well as by delegates of the Commission of the European Common Market. Among the proposals examined was that OEEC (Organization for European Economic Co-operation) should be replaced by an Organization for Western Economic Co-operation. This proposal was adopted by OEEC and the basis was thus laid for a new economic organization which will join countries on the two shores of the Atlantic. It should become operative about mid-1961. *G. Agric. Domen.* 1960, 70, No. 3.—E.B.O.